

New  Brunswick

Environmental Protection Plan

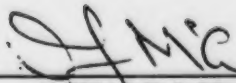


New Brunswick
Department of Transportation

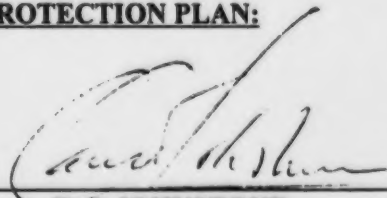
Third Edition
May, 1998

ENVIRONMENTAL PROTECTION PLAN
FOR
NEW BRUNSWICK DEPARTMENT OF TRANSPORTATION

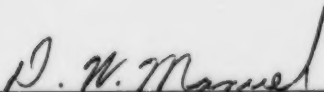
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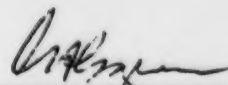
DONALD J. McCREA
DEPUTY MINISTER



B. J. JOHNSTONE
ASSISTANT DEPUTY MINISTER
AND CHIEF ENGINEER



D. W. MANUEL
EXECUTIVE DIRECTOR
ENGINEERING SERVICES



G. A. GOGUEN
DIRECTOR OF PLANNING
AND LAND MANAGEMENT

MAY 1998
THIRD EDITION

ABSTRACT

The Environmental Protection Plan (EPP) is a comprehensive document outlining the Department of Transportation's general approach to a wide range of activities that are an integral part of its mandate. The Department's approach to environmental protection places a high priority on impact avoidance and covers procedures and methods in Highway Planning, Design, Construction, Structures, and Operations.

Each area covered within a section contains a brief discussion, followed by Protection Measures used by the Department.

The Highway Planning and Land Management Branch contacts key provincial and federal departments and agencies early in the planning process to develop physical and environmental constraint mapping for corridor selection, and obtains further input and information from public information sessions and meetings. Planning also registers major projects with the Department of the Environment for an environmental review process. Additional studies are often required at this stage and the approval of the project usually includes a number of terms and conditions to be complied with during design and construction.

The Design Branch responsibilities include further environmental considerations in establishing the final horizontal and vertical alignment and environmental protection, and minimizing environmental impacts during field surveying and subsurface investigations.

The section on construction illustrates the environmental protection measures employed in activities such as clearing, grubbing, excavation, borrow, foundation work, materials, disposal areas, hazardous material handling, and work camps.

The highway structures section describes environmental protection for detour construction, culvert installation, foundation work, and superstructures.

The section on operation and maintenance includes a number of environmental protection measures for summer and winter highway maintenance programs, bridge maintenance, and ferry operations.

The EPP contains specific approaches and protection measures used when dealing with environmentally sensitive areas such as agricultural lands, domestic water supplies, designated watersheds, environmentally significant areas, habitat of species at risk, wetlands, estuaries, fish habitat, forest resources, historic resources, and wildlife habitat.

The EPP refers to contingency plans for fuel and chemical spills, wildlife encounters, historic resources, and forest fires.

This document is generic in nature and is intended to be updated periodically to reflect changes in procedure and policy, knowledge gained through monitoring efforts, and changes in technology that are beneficial in environmental protection.

NOTE: This EPP dated "MAY 1998" is the third edition of this document released by DOT. It replaces the second edition dated "May 1995".

ACKNOWLEDGEMENT

The first edition of this EPP was prepared by DOT after reviewing the EPP produced by NB Power, July 1991. Information included in the original document was compiled from various Branches within the DOT, and organized in a format similar to that of the NB Power EPP.

The current edition of the EPP incorporates revisions and contributions provided by various regulatory agencies (Environment Canada, Department of Fisheries and Aquaculture, Department of Fisheries and Oceans, New Brunswick Department of the Environment, and New Brunswick Department of Natural Resources and Energy), in addition to revisions provided by various Branches within DOT.

Environmental Protection Measures have been developed within DOT as a result of legislative requirements and a desire to improve highway design, and construction methods and procedures, to have a positive impact on the environment in which we work.

DOT extends its gratitude to NB Power for providing initial information on their EPP, and also to the various provincial and federal departments and agencies that have contributed through their review or research and past experiences in establishing effective procedures in environmental protection.

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SECTION 1: INTRODUCTION

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The EPP outlines the methods which DOT uses to plan, design, construct, maintain, and operate highway facilities to minimize damage to the environment, in a manner consistent with federal and provincial environmental regulations applicable to New Brunswick.

The DOT strategy for environmentally sustainable development involves a pro-active approach to environmental protection as follows:

- priority is placed on avoiding areas of potential environmental concern and, thereby, avoiding potential for impacts;
- if areas of potential environmental concern cannot be avoided, appropriate mitigative measures are identified to ensure that there are no significant adverse impacts; and
- compensation is provided in unique circumstances, if significantly adverse impacts are identified for the environment.

The EPP provides:

- documentation of environmental concerns and appropriate protection measures relevant to the activities involved;
- guidelines to personnel regarding the procedures necessary to protect the environment and minimize adverse environmental impacts; and
- a reference document in sufficient detail for the implementation of environmental protection measures.

Specifically, the objectives of this Environmental Protection Plan are as follows:

- to provide guidelines for environmental protection;
- to facilitate the acquisition of approvals and permits required under various acts and regulations, and to ensure that permit conditions are included as standard construction and operation procedures;
- to explain environmental requirements to DOT personnel, and to show how these requirements are to be met;

-
- to provide regulatory agencies, Contractors, and the public with a description of DOT's approach to highway planning, design, construction, and maintenance; and
 - to ensure that environmental requirements are practical and realistic in light of necessary planning, design, construction, operation, and maintenance procedures.

However, the EPP cannot cover, in detail, the complete range of situations which may arise. In unique situations, site-specific environmental protection plans or measures will be developed in consultation with appropriate provincial and federal departments or agencies.

Good judgement and decisions by DOT personnel in the field are also essential for effective environmental protection. The EPP attempts to provide relevant criteria on which to base field decisions and protocol for making these decisions.

DOT has also developed a field manual entitled Environmental Field Guide (formerly titled Field Guide on Environmental Protection Practices for Highway Construction and Maintenance), as an additional aid to environmental protection and to complement this EPP.

1.1 ORGANIZATION AND USE OF THE EPP

This document is designed as a guide to be used by DOT, its consultants, and Contractors, and other government agencies, by outlining procedures in environmental protection and emphasizing DOT's proactive stand on environmental concerns.

It is organized as follows:

Section 1 : introduces environmental protection planning within DOT and identifies objectives and uses for this EPP.

Section 2 : provides a brief introduction to highway facilities.

Section 3 : provides a general outline of the overall approach to environmental protection and how environmental concerns and constraints are considered during the planning and design process.

Section 4 : details environmental protection measures in relation to specific highway construction activities which have identifiable environmental concerns. Three items included in this section that are also relevant to Sections 5 and 6, are Disposal Areas, Construction Work Camps, and Storage, Handling, and Transfer of Fuels and Other Hazardous Material.

Section 5 : details environmental protection measures for specific construction activities related to highway structures and bridge placement.

Section 6 : details protection measures to be implemented by DOT personnel in the maintenance of highway facilities and ferries.

Section 7 : outlines procedures to be implemented to minimize negative impacts with respect to a number of specific environmental resource categories and areas of special environmental consideration.

Section 8 : outlines contingency procedures and responsibilities in relation to potential hazardous material spills, wildlife encounters, historical resource discoveries and forest fires.

Section 9 : clarifies functions, responsibilities and reporting procedures by DOT personnel on environmental issues.

Section 10 : emphasizes the relationship of the EPP to the Standard and Particular Contract Specifications, and to work carried out by DOT and hired firms to ensure a responsible approach to environmental protection.

1.2 DEFINITIONS

Terms frequently used in this document:

buffer zone - distance measurement from each side of a natural watercourse; 30 m, unless otherwise indicated.

For small streams (<3 m in width), assume measurement is from centre of stream.

contaminant - any solid, liquid, gas, microorganism, odour, heat, sound, vibration, radiation or combination thereof that affects the natural, physical, chemical or biological quality or constitution of the environment.

(Clean Water Act)

DARD - Department of Agriculture and Rural Development (Provincial).

DFO - Department of Fisheries and Oceans (Federal).

DMCH - Department of Municipalities, Culture and Housing (Provincial).

DNRE - Department of Natural Resources and Energy (Provincial).

DOE - Department of the Environment (Provincial).

DOT - Department of Transportation (Provincial).

ecological reserve - any place containing unique and rare examples of botanical, zoological, pedological or geological phenomena that are protected in order to preserve the natural ecosystem and habitat in the defined area.

(Ecological Reserves Act)

environmentally sensitive areas - places where the biological, geological, hydrological or environmental conditions necessitate taking special precautions to prevent pollution of the environment.

(Clean Water Act)

environmentally significant areas - places that are distinctive because:

- a) they contain rare species of animals or plants or a rich diversity of species representative of an ecological zone;
- b) their disturbance would have serious ecological consequences; or,
- c) they contain geological or other features of specific scientific interest.

(DOE)

fish habitat - spawning grounds and nursery, rearing, food supply, and migration areas on which fish depend directly or indirectly in order to carry out their life processes.

(Fisheries Act)

ford - a crossing located in a stream, river, creek or brook where the water is shallow enough at that point in the channel to be traversed by motorized vehicles, and where the banks and bed of the channel are stable enough that use of the crossing will not result in any disturbance of them.

OM -Other Material, being any excavated material other than solid rock (i.e., soils). Often referred to as "common" material.

recognized fording location - a ford as indicated on the most recent 1 to 50,000 National Topographic System or a place where persons have been fording a river, brook, stream, creek or other flowing body of water for a period of at least five consecutive years.

(Watercourse Alterations Technical Guidelines)

ROW - Right-of-Way.

watercourse - the full width and length, including the bed, banks, sides and shoreline, or any part, of a river, creek, stream, spring, brook, lake, pond, reservoir, canal, ditch or other natural or artificial channel open to the atmosphere, the primary function of which is the conveyance or containment of water whether the flow be continuous or not.

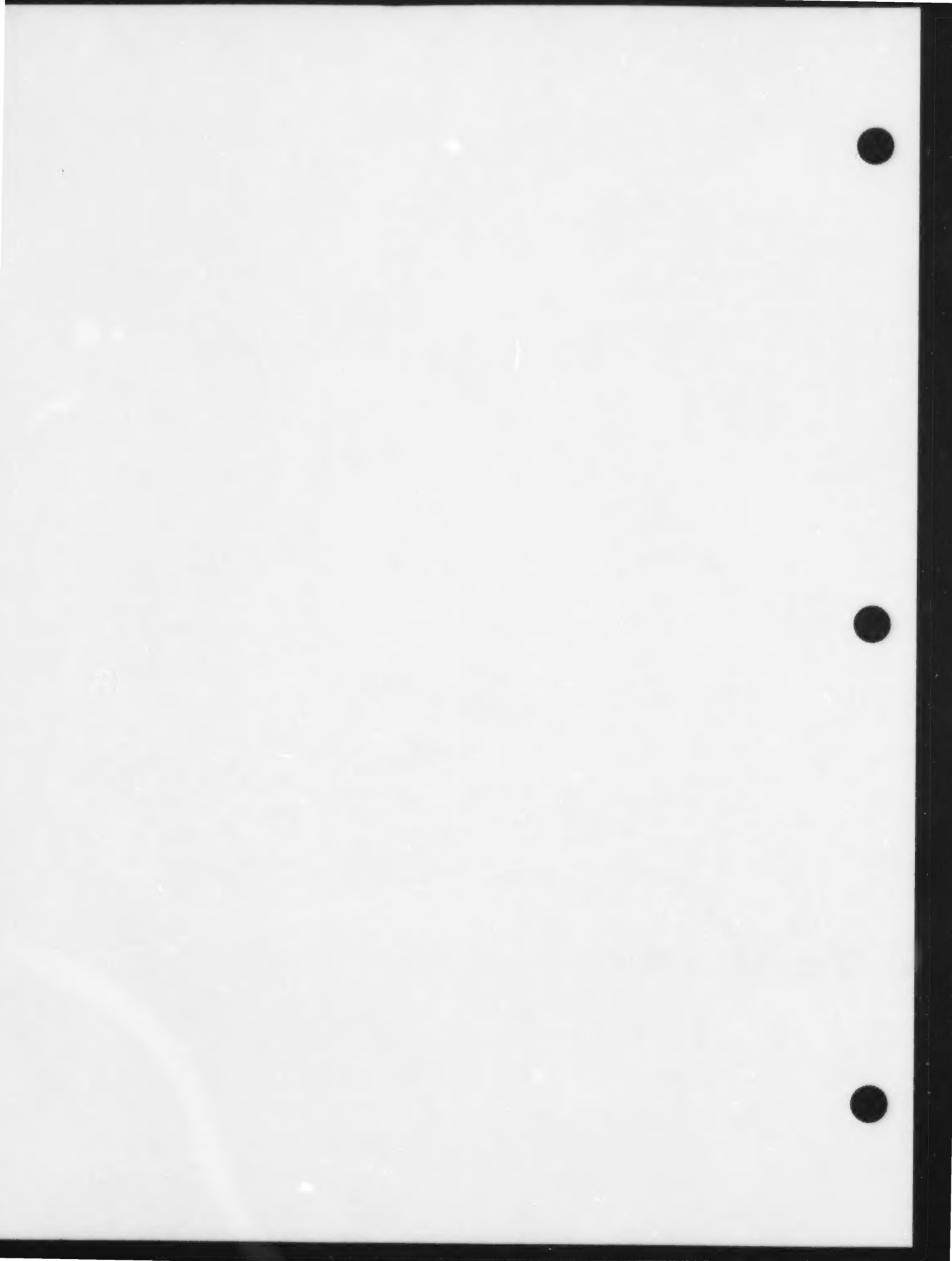
(Clean Water Act)

Note: In this document, watercourse may include wetland areas, marine shore drainage areas, and the intertidal zone, where applicable (see Sections 7.3 and 7.9).

wetland - wetlands are lands transitional between terrestrial and aquatic systems where the water table is at or near the surface or the land is covered by shallow water at some time during the growing season. Wetlands are characterized by poorly drained soils and predominantly hydrophytic or water tolerant vegetation.

(DNRE)

SECTION 2: HIGHWAY INFRASTRUCTURE



SECTION 2: HIGHWAY INFRASTRUCTURE

In New Brunswick the highway infrastructure consists of approximately 17 800 km of arterial, collector, and local highways that are operated and maintained on a year-round basis. DOT is very active throughout the province upgrading and re-aligning existing highways, and developing new highways, to further increase safety to the public and improve the highway network. Highway infrastructure impacts on the environment, therefore protection measures are incorporated in any project from inception to completion.

Highway projects go through a number of stages (planning, design, ROW purchase, construction) before a finished product emerges. Then the highway infrastructure must be operated and maintained.

The geometric configuration of a highway varies from project to project depending on the needs and demands it serves. ROW requirements vary from approximately 20 metres on a local road to in excess of 200 metres for a four-lane divided highway with a treed median.

Figures 2.1 and 2.2 illustrate typical cross-sections with an approximate range of land requirements needed to establish a highway:

- Figure 2.1 depicts an RLU 80 highway (Rural Local Undivided) having a design speed of 80 km/hr.
- Figure 2.2 depicts an RAD 110 highway (Rural Arterial Divided) having a design speed of 110 km/hr.

Median width varies from 22.5 to 82.5 metres centreline to centreline unless a lesser or greater width is required for very specific situations.

DOT's staff use both the Department's Highway Maintenance Management System Manual for direction in the operation and maintenance of the existing highway system, and the Bridge Maintenance Manual for bridges.

The diagram illustrates a cross-section of a road pavement structure. The central section is labeled 'EXISTING GROUND' and has a width of 7000 mm. Above this, a 'SUBGRADE' layer is shown with a thickness of 0.03 m/m. The top layer is 'ASPHALTIC CONCRETE' with a thickness of 0.03 m/m. The total width of the asphaltic concrete layer is 15000 mm. The structure is flanked by 'SHOULDERING MATERIAL' consisting of 'CRUSHED GRAVEL' (150mm and 100mm layers) and 'GUIDE RAIL'. The shouldering material has a thickness of 0.03 m/m. The total width of the shouldering material is 15000 mm. The overall width of the structure is 30000 mm. The diagram also shows a '2:1 Over 3000' slope on the right side.

[illegible]

PLANS:
• DITCH DEPTHS:
STANDARD - 600mm
FOR UNDERCUT SUBGRADE - 900mm
O.M.

THE BASIC UNIT OF DIMENSIONING IS MILLIMETRES

NOTE: DITCH WIDTH TO BE 3 000 WHEN DEPTH OF ROCK CUT IS GREATER THAN 10 metres.

FIGURE 2.1 Highway Classification RLU 80

RAD 110/120

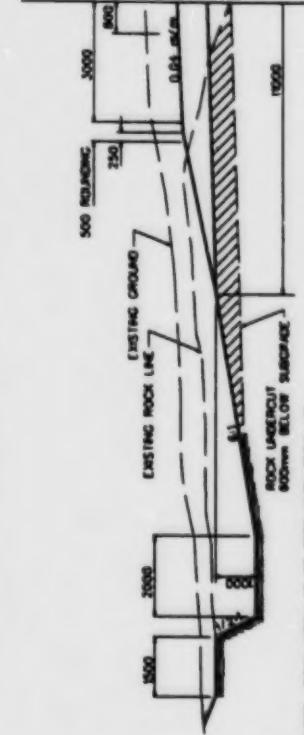


FIGURE 2.2 Highway Classification RAD 110/120

SECTION 3: HIGHWAY PLANNING AND DESIGN

SECTION 3: HIGHWAY PLANNING AND DESIGN

Major highway projects go through an extensive planning phase in the Planning and Land Management Branch prior to being approved and forwarded to the Design Branch for detailed design work.

During the planning phase, environmental constraints and concerns are identified through data collection, consultation with provincial and federal departments or agencies, and informal public information sessions. These constraints and concerns are then addressed during both planning and design by the following mechanisms in order of priority:

- avoid any impact;
- minimize/mitigate the impact;
- compensate for the impact.

3.1 HIGHWAY PLANNING

The planning of a new or expanded highway corridor can be divided into three main functions:

- data collection and constraint mapping;
- corridor selection and presentation to public; and
- project registration and environmental impact assessment screening.

3.1.1 Data Collection and Constraint Mapping

A comprehensive approach is used in the planning process to select a highway corridor. Care is taken to ensure that the recommended corridor is both feasible and economical and provides the proper balance of engineering, environmental, social, and economic considerations.

In the initial planning phase, a broad corridor concept is used to obtain the data necessary for developing a recommended highway corridor. Once the base property and topographical mapping and aerial photography is assembled, contact is made with the following departments and agencies to solicit information and identify constraints:

- Provincial departments and agencies include Agriculture and Rural Development, Economic Development and Tourism, Fisheries and Aquaculture, Environment, Natural Resources and Energy, Municipalities, Culture and Housing, NB Power, and NB Telephone.
- Federal departments include Fisheries and Oceans, and Environment Canada.

A list of key regulatory agency contacts is provided in Appendix A of this EPP. A list of key DOT departmental contacts is provided in Appendix B of this EPP.

With information on the broad corridor, physical and environmental constraints can then be added to the base mapping to assist in selecting narrower highway corridors for further analysis.

3.1.2 Corridor Selection and Presentation to the Public

The task of avoiding or minimizing the impact on identified environmental constraints while balancing the engineering and socio-economic considerations is carried out at this stage. The goal is to arrive at a recommended highway corridor to present to the public for further input and feedback.

Some of the features or constraints considered at this stage include:

- areas of steep terrain;
- areas prone to erosion;
- soil conditions;
- flood plains including designated flood risk areas;
- residential, institutional, commercial, and industrial development;
- contaminated areas;
- national and provincial parks;
- environmentally significant areas;
- domestic water supplies;
- designated watersheds;
- designated groundwater protection areas;
- historic sites; and
- known sensitive wildlife areas such as ecological reserves, game management areas, habitat of species at risk, deer/moose wintering areas, wetlands, estuaries, intertidal zone, and marine shore drainage areas.

Corridors are also developed in an attempt to avoid or minimize the impact on agricultural lands (property severance, drainage field accessibility, loss of crop land, reduction of field cropping operation efficiency, etc. [see Section 7.1]), tree plantations, areas of silviculture activities, and test plots; to limit the number of stream crossings and necessity of stream diversions; and to maintain access to properties.

Once the recommended highway corridor has been thoroughly reviewed within the Department, and has received preliminary approval from DOT's senior management, it is prepared for presentation to the general public. Informal public information sessions following an "open house" format are normally used at this stage. Notification of the sessions or meetings is forwarded to the provincial and

federal departments and agencies outlined in Section 3.1.1 to provide an opportunity for further review and comments. Secondary meetings are held with the property owners to present plans for access to severed properties.

Information from these sessions can identify previously unknown local features or concerns that may require modifications or a complete change to the original highway corridor or further refinements at the more detailed highway design stage.

3.1.3 Project Registration and Environmental Impact Screening

The Environmental Impact Assessment (EIA) Regulation, covered in the NB Clean Environment Act, requires that major Highway and Bridge projects be registered into a screening process, which provides provincial and federal departments and agencies an opportunity to further evaluate the project in more detail.

A provincial environmental review committee chaired by DOE carries out the screening. The Minister of the Environment determines if a project is to be "screened in" for a full Environmental Impact Assessment (EIA) or "screened out" with particular terms and conditions attached.

For projects that are screened into a full EIA, DOE and its review committee prepare a set of guidelines to reflect the issues and concerns specific to the project. These guidelines are presented to the public for input into the EIA process as well. From the guidelines, DOT prepares "Terms of Reference" by which to conduct the EIA. Once DOT's environmental consultant has completed the EIA, it is subject to a review and evaluation by DOE and its review committee, as well as by the public at large through formal public meetings. After a thorough review has been completed, DOE makes a recommendation on the project and forwards it to Cabinet. The Cabinet will use an Order In Council (OIC) to either approve or reject the project. A number of terms and conditions may be attached to the OIC approval, which have to be completed at the appropriate time during project development.

A project that is "screened out" after it has been determined that a full EIA is not needed, usually requires a series of environmental studies to be completed to satisfy various issues and concerns that have been raised by DOE and the provincial review committee. Consultants are hired to carry out the required studies and once the issues and concerns have been addressed, the Minister of the Environment issues a "Determination" for the project to proceed. Terms and conditions are attached to the approval of the project and are then forwarded to the various branches within DOT for action at the appropriate time.

If, following initial EIA approval, changes to the alignment or project design are required, the modified project must be reevaluated under the EIA process. If the changes are determined to be outside the considerations contained within the initial review, the project must be screened for the new design, and additional information/study requirements may be required.

In addition to the requirements stated in the EIA Regulation under the NB Clean Environment Act, it should be noted that typically highway projects in NB are also subject to federal assessment under the Canadian Environmental Assessment Act (CEAA), provided a Federal trigger, such as funding, navigable waters, transfer of federal lands, etc. is associated with the project. Otherwise a project would be screened only at the provincial level.

Protection Measures

Environmental protection is considered throughout the highway planning phase from the initial data collection and development of a recommended highway corridor to public consultation and project registration for EIA screening.

- a) Contact is made with key provincial and federal departments and agencies early in the planning stage to solicit information and identify environmental constraints and concerns.
- b) Constraint mapping is used to identify a wide range of physical features and areas of environmental concern. The selection of a recommended highway corridor is then developed on the premise of avoiding impacts where possible and minimizing the impact when avoidance is not feasible. Protection measures for areas of special environmental consideration are further outlined in Section 7.
- c) Public information sessions and meetings for main lanes and access roads are carried out to provide a forum for further input and the identification of constraints and issues of a local nature that may otherwise not be identified. The sessions also provide another opportunity for review by interested provincial and federal departments and agencies.
- d) The federal and provincial EIA processes identify the need for a full EIA, if additional studies are required to gather more information, and/or allow the reviewer(s) to identify particular environmental protection measures or particular conditions to be addressed at the design and/or construction phases of the project.
- e) Recommendations are forwarded to the appropriate Branch within DOT to address issues that need further investigation to determine if further mitigation during the design process is possible. One example would be to reduce the median width and roll the vertical alignment with the natural terrain as much as possible in areas where active agricultural land cannot be avoided.

3.2 HIGHWAY DESIGN

Highway design is divided into four main functions: Route Location, Surveying, Geotechnical Investigations, and Design.

3.2.1 Route Location

Discussion

In New Brunswick, there are three highway classifications: arterial, collector or local. Each of these classifications are subdivided into rural or urban, referring not only to municipal boundaries but to adjacent land use.

The Transportation Association of Canada states that classification refers to the category of the road in terms of its:

- environment (rural or urban);
- function (arterial, collector or local road);
- cross-section (undivided, divided); and
- design speed.

Environmental impact, ROW requirements, and overall costs are variable depending on the type of road constructed.

Route location and geometric design of a highway are affected by numerous factors and controlling features (see Section 3.2.4).

Protection Measures

- a) Locate highways such that, wherever possible, they blend in with the topography.
- b) Locate highways to minimize the impact on wildlife and fisheries habitat, the natural environment, and adjacent land use and development by adjusting the horizontal/vertical geometry and ROW requirements. The final alignment decision and ROW requirements have to also consider the overall costs of the highway project.
- c) Select alignment and grade, within appropriate design standards, that avoid excessive longitudinal and cross-sectional slopes and thereby lessen terrain disturbance and the potential for soil erosion.

- d)** Consider, during highway alignment selection:
- (i)** the location of other highways, railways or other transportation facilities;
 - (ii)** watercourses, wetlands, estuaries, intertidal zones, and marine shore drainage areas;
 - (iii)** historic sites;
 - (iv)** deer/moose wintering areas including deer yards;
 - (v)** agricultural land;
 - (vi)** adjacent land use and development;
 - (vii)** habitat of species at risk;
 - (viii)** groundwater or domestic water supplies;
 - (ix)** silviculture areas;
 - (x)** ecological reserves, parks and recreational areas;
 - (xi)** soil and rock types and conditions;
 - (xii)** utilities, power lines, fibre-optic lines, etc.;
 - (xiii)** recreational trails;
 - (xiv)** protected areas;
 - (xv)** contaminated areas;
 - (xvi)** flood plains including designated flood risk areas;
 - (xvii)** environmentally significant areas;
 - (xviii)** design speed and highway classification; and
 - (ixx)** construction costs.

3.2.2 Surveying

Discussion

Surveying includes gathering all the information required for the design and identification of ROW of a specific section of highway. This includes cutting centreline and cross-section offsets of sufficient width to provide a clear line of sight for survey equipment and access to the site for soils testing equipment. It also includes legal surveys.

Protection Measures

- a) DOT notifies property owners of its intent to carry out a survey in their area. DOT uses the most up to date source of owner identification information. DOT's intent is to give as much notice as is practical for each survey.
- b) The survey and geotechnical investigations should be carried out in such a way to minimize damage to the property while enabling the survey and geotechnical investigation to proceed.
- c) When cutting in the survey area, merchantable timber should be cut in salvageable lengths if possible. Any softwood or hardwood greater than 5 inches D.B.H. (Diameter Breast Height) should be cut in 8 - foot lengths if cutting is required. If softwood trees are encountered that could give a minimum top size of 7 inches at a 14 - or 16 - foot length, consideration should be given to cutting at this length for saw logs instead of 8 feet for pulp. The ability to handle and move these logs must be a consideration.
- d) Trees should be felled in a way that damage to standing trees adjacent to the survey line is minimized.
- e) In an effort to minimize negative impacts on the environment, trees shall be felled away from and not into or over a watercourse. Slash shall not be placed or left in watercourses. Any debris and excavated material shall be removed from a watercourse and adjacent areas and disposed of, or placed in a manner such that it cannot enter a watercourse.
- f) Care should be taken not to leave felled trees and brush so that they block existing access roads or clutter existing cleared land and road ROW.
- g) All necessary precautions are to be used to prevent the discharge or loss of any fuels and oil into a watercourse.
- h) Machinery and pollutants are to be located or stored in areas not in danger of floodwaters, and at least 30 m away from a watercourse.

- i) Any litter shall be removed from the survey site.
- j) Should the proposed alignment be altered or the project not proceed, cut areas shall be rehabilitated or compensated for in consultation with the land owner.
- k) The DOE and DNRE shall be notified of the location of the proposed survey work at least 72 hours before any activity takes place.
- l) Special protocols with the Department of Agriculture and Rural Development are followed for crossing agricultural lands, growing specialized crops, such as seed potatoes.

3.2.3 Geotechnical Investigations

Discussion

The location and design of a highway facility is dependent on the soil conditions where the proposed route will pass. A review of geological information and soils testing is required to determine the suitability of the "in situ" material for highway construction.

Suitability includes identifying whether the soil and bedrock contain any naturally occurring contaminants that may result in acidic drainage.

Soils testing for new highway alignments is done with crawler-mounted (tracked) excavators and drill rigs. Soils testing adjacent to an existing highway is usually done by a drill mounted on a boom truck which does not leave the existing highway surface.

Protection Measures

- a) All drill holes/test pits are filled-in to original ground level. Drill holes/test pits and vehicle tracks within 30 m of a watercourse are covered with evergreen boughs or hay.
- b) A Watercourse Alteration Permit is to be obtained before conducting any work within 30 m of a watercourse. A copy of the Permit is to be kept on site at all times and all DOT and Consultant personnel are to be familiar with the stipulations within it. For highway construction projects which do not require registration under the EIA Regulation or are screened out of the EIA process, no permit is required for the excavation of test pits, test drilling or the clearing of trees for survey purposes within 30 metres of a watercourse provided the conditions outlined in Appendix C (Pre-Construction Activities Policy) are adhered to.

- c) Watercourse crossings during geotechnical investigations are avoided whenever possible. Where a crossing cannot be avoided, the drill rig or excavator shall cross a watercourse at one location only for each watercourse. This may be at the narrowest streambank location or a wide section if it has a stable bed and bank. Crossing sites may be limited when survey lines extend through thick wooded areas.
- d) To avoid damage to the ground cover, care is taken when turning the drill rig.
- e) Any ruts cut into the vegetative mat or disturbed stream banks are stabilized against erosion with rock, evergreen boughs, seed, mulch, or other suitable material, such that erosion is prevented.
- f) Drilling in the streambed, which may be required for culvert and bridge design, is kept to a minimum to ensure that the rig is travelling in the watercourse as little as possible.
- g) Drilling in the streambed should be conducted between June 01 and September 30 in areas containing salmonid fish, unless otherwise specified in the Watercourse Alteration Permit.
- h) Where possible, drilling in or near a watercourse is to be carried out using a hollow stem auger (dry bit) as opposed to a rotary drill which utilizes pressurized cooling/flushing fluid.
- i) If rotary drilling must be carried out in or near a watercourse, a containment area is to be established, to prevent the drilling fluid from entering the watercourse. If rotary drilling must be carried out in the channel, the drill rig is to be fitted with recovery equipment to prevent the escape of drilling fluid to the watercourse.
- j) No advancement of drill casing by fluid jetting is to be carried out in or near a watercourse.
- k) When drilling is carried out on the ice, all material must be removed from the watercourse before the site is vacated.
- l) Equipment surfaces should be free of deleterious substances such as oil, grease etc. before working in the wetted portion of the watercourse.
- m) Equipment leaking fuel or fluids shall be immediately repaired.
- n) Equipment shall be serviced in an area at least 30 m away from any watercourse or other environmentally sensitive area.
- o) All garbage shall be removed from the work area.

- p) If any artifacts of historic or archaeological significance are encountered during the sub-surface survey, work will be stopped immediately and the Director, Archaeology Branch, DMCH, will be contacted.

3.2.4 Design

Discussion

Highway design, including the horizontal and vertical geometry and the cross-sectional elements, is controlled by the following criteria:

- the number and type of vehicles using the highway;
- adjacent land use and development (existing or potential);
- the desired design standard/classification of the highway;
- watercourses;
- environmental constraints;
- the local topography; and
- the soil conditions.

Highways with significant truck traffic may be designed with climbing lanes and increased pavement widths at intersections to accommodate truck turning movements. As traffic volumes increase, the typical 2-lane highway configuration may be upgraded to a multi-lane facility to provide an acceptable level of service and safety.

The design standards (design speed and classification) determine the typical cross-section to be used and the vertical and horizontal curve requirements. Together with the topography (rugged, rolling or flat) and soil conditions (from rock to silt), the design standards directly affect the ROW required and the amount of impact on the natural environment and on adjacent land use and development.

Rock cuts typically require less ROW than earth cuts because the backslopes are nearly vertical, whereas earth cuts typically have 3:1 backslopes, or 4:1 in silty soils.

Protection Measures

For areas of potential environmental concern that cannot be avoided, mitigation measures will be identified to ensure there are no significant adverse impacts. Means of lessening environmental impacts considered during the design process include specifying the following measures:

-
- a) Controlling erosion and siltation to protect watercourses and fish habitat by including in the design:
- (i) Maintaining minimum buffer zones of 30 m adjacent to a watercourse. However, site-specific conditions may dictate additional watercourse-specific environmental requirements for approval of regulatory agencies for acquisition of Watercourse Alteration Permits;
 - (ii) Limiting the size and scope of the work area that can be worked on at any one time to minimize erosion;
 - Grubbing shall not be carried out near watercourses until proper erosion control measures are in place, nor within buffer zones until stream flow has been diverted into a temporary or new structure/channel, thus reducing the amount of erosion and sediment load entering the watercourse.
 - Clearing lines for new highways are not necessarily taken out to the edge of the ROW, but only as far as necessary for construction purposes or to provide the highway exposure to the sun.
 - (iii) Riprapping the ends of culverts, ditches and slopes susceptible to erosion, and the banks of watercourses, to a height that is normally reached in flood conditions;
 - (iv) Using natural watercourse features and structures for stream diversions, in accordance with Watercourse Alterations Technical Guidelines (DOE 1994);
 - (v) Retaining natural drainage patterns whenever possible, as well as rehabilitation of existing soil erosion control or drainage systems located on agricultural land;
 - (vi) Placing geotechnical fabric or sediment control fence to control erosion and sedimentation;
 - (vii) Installing sediment ponds to intercept and retain sediment-laden runoff so that sediment may settle out;
 - (viii) Hydroseeding and/or mulching exposed material in cut and fill operations as they progress, to stabilize soils against erosion;
 - (ix) Installing erosion control structures and geotextile fabric to control siltation. Structures used include:
-

- Type "A" Check Dams (Spillway for Sediment Pond Dykes);
- Type "B" Check Dams (Riprap Erosion Control for Ditches);
- Type "C" Check Dams (Straw Bale Erosion Control for Ditches); and
- Sediment Control Fence.

- (x) Consulting with DFO, DOE, DNRE, and DARD during the design process.

Figures 3.1 to 3.4 at the end of this section illustrate the erosion control structures used.

- b) Protecting fish habitat by means of the following measures, to the extent possible:

- (i) Culvert location and design:

- Align roads to cross streams at right angles, since this minimizes the length of a crossing and therefore, the culvert.
- Locate culverts on straight stream segments.
- Locate culverts in stream stretches with level approaches and stable banks.
- Locate culverts at sites where the channel gradient is at or near zero and water velocity is relatively constant upstream and downstream.
- Avoid locating crossings at sites where culvert installation will involve large fills or approaches with deep or lengthy cuts.
- Avoid locating roadway interchanges near watercourses as these will normally require multiple culvert installations and the placement of large amounts of fill adjacent to the watercourses.
- Design culverts in consultation with DFO, DOE, and DNRE.
- Use energy dissipators at culverts such as baffles, plunge pools, large rocks, riprap, etc.

If the above details cannot be achieved a site-specific plan will be developed.

- (ii) Provide for fish passage;

-All fish passage facilities must receive approval pursuant to Section 20 of the federal Fisheries Act. Design should be undertaken in consultation with DFO, DOE, and DNRE.

- (iii) Avoid permanent stream diversions where possible.
- c) Adjusting ROW requirements to address specific environmental concerns on a case by case basis, by means of:
 - (i) Using underground drainage;
 - (ii) Steepening backslopes if soils conditions permit;
 - (iii) Installing retaining walls; and/or
 - (iv) Reducing median widths of divided highways.
- d) Designing in consultation with DFO and DNRE in compliance with the terms and conditions as set out in the "Watercourse Alteration Permit" issued by DOE.
- e) Adhering to any conditions specified by DOE in the design process, arising from the Environmental Impact Assessment Screening Determinations (i.e. in the form of terms and conditions solicited from other reviewing departments and/or recommendations from studies that may have been carried out during the screening), and if applicable, implementing any mitigative measures identified as a result of a federal assessment conducted in accordance with CEAA.
- f) Developing monitoring programs, where required, based on discussions with regulatory authorities, applicable Environmental Impact Assessments, and experience from similar projects.
- g) Assessing and documenting pre-construction conditions as required in applicable monitoring programs, through an examination of environmental features along the highway route. This may include documentation of the following:
 - (i) groundwater quality in the vicinity of areas that may be potentially impacted;
 - (ii) the quality of selected surface waters draining potentially disturbed areas;
 - (iii) fish populations;

- (iv) species at risk;
 - (v) agricultural soils and crop yield; and
 - (vi) aquatic habitat.
- h) Protection measures (including those related to Highway Design) for areas of special environmental consideration are outlined in Section 7.

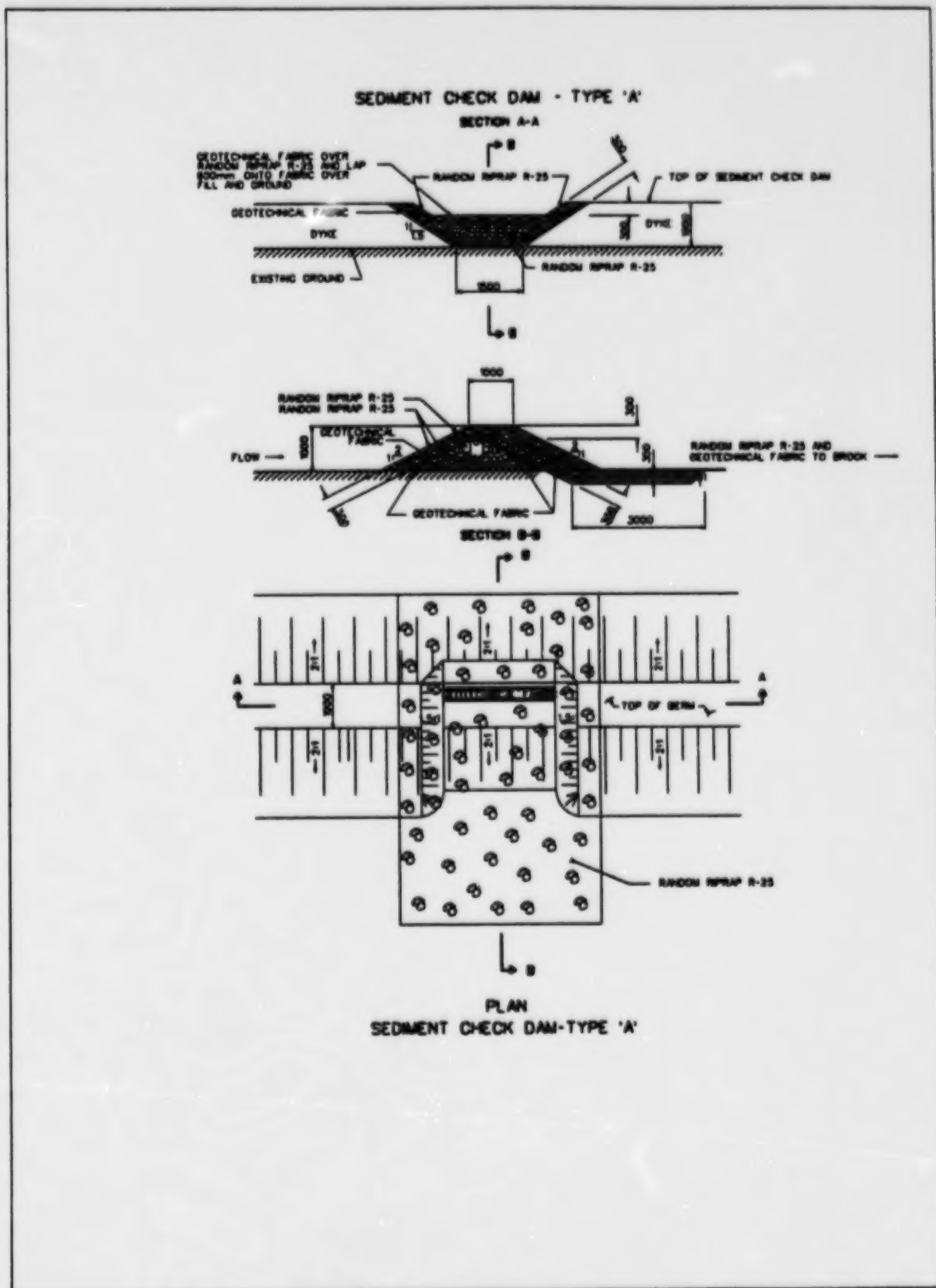
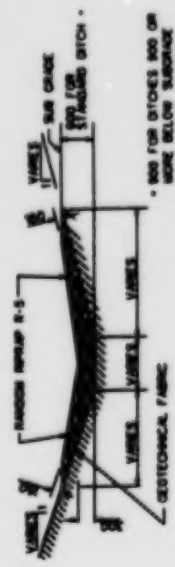
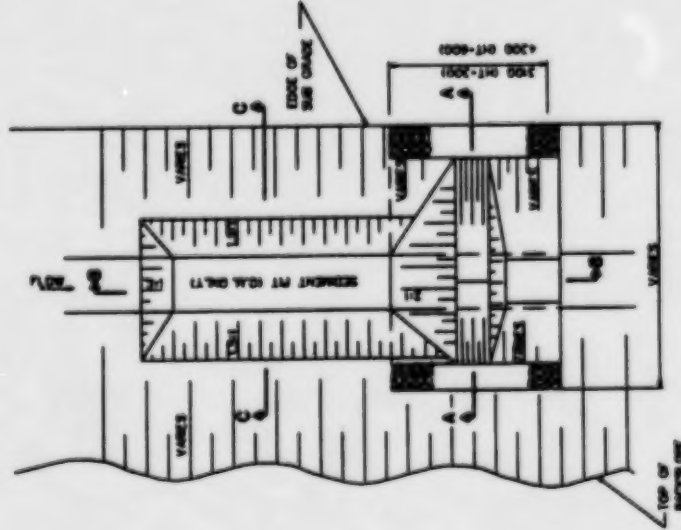
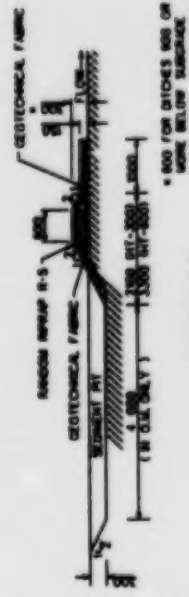


FIGURE 3.1 Sediment Check Dam - Type A

RIPRAP EROSION CONTROL FOR DITCHES TYPE "B"



SECTION A-A



SECTION B-B

DITCH DEPTH, WIDTH AND SIDE SLOPES OF SEMENT PIT
 MAY VARY WITH SOIL CONDITIONS AS DIRECTED
 BY THE ENGINEER



SECTION C-C
(BY O.M. ONLY)

FIGURE 3.2 Riprap Erosion Control for Ditches - Type B

STRAW BALE EROSION CONTROL FOR DITCHES

TYPE 'C'

NOTE: NUMBER OF BALES REQUIRED VARIES DEPENDING ON BACKSLOPE AND FORESLOPE.

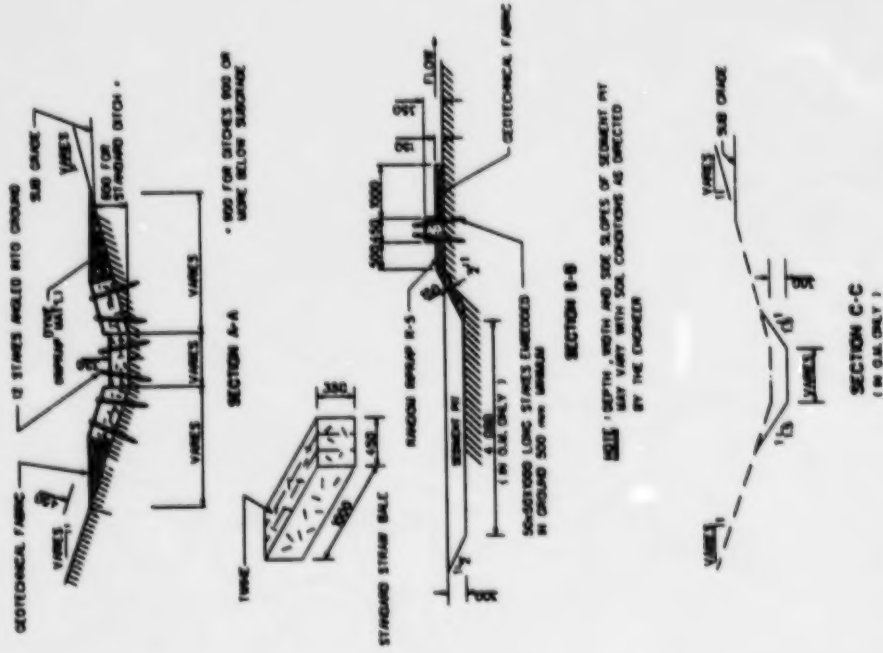
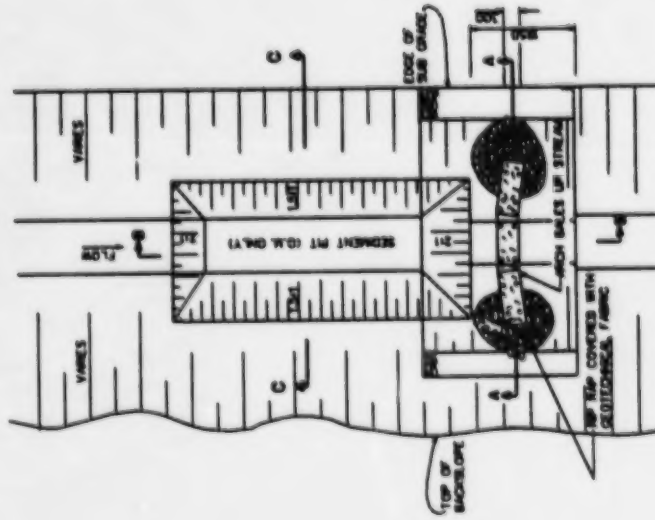


FIGURE 3.3 Straw Bale Erosion Control for Ditches - Type C

SEDIMENT CONTROL FENCE

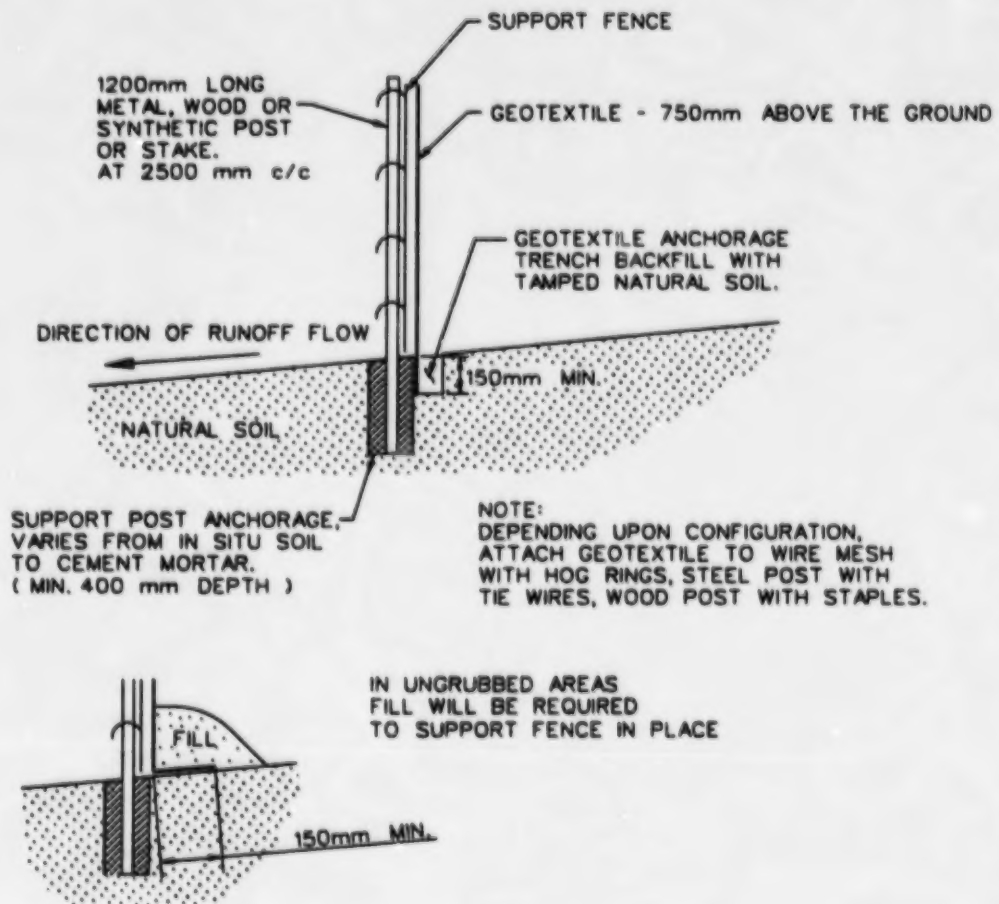


FIGURE 3.4 Sediment Control Fence

SECTION 4: CONSTRUCTION ACTIVITIES

SECTION 4: CONSTRUCTION ACTIVITIES

The Construction Phase is the physical implementation of the planning and design phases. Environmental protection measures are put into effect during this phase. Construction of a project requires work to be carried out under contract items more or less in sequence, before a highway can be opened to the public for use. The following contract items and other construction activities listed have protective or mitigating measures included in their wording, or by their very nature provide environmental protection.

As an additional aid to environmental protection the Department has developed the Environmental Field Guide (Washburn & Gillis Associates Ltd., 1998) to complement the EPP. This is a revision of the Field Guide on Environmental Protection Practices for Highway Construction and Maintenance (Washburn & Gillis Associates Ltd., 1994). The Department has developed a training program from this guide for all field personnel (both DOT and Contractor employees). DOT field personnel receive training based on the guide and training of Contractor field personnel was initiated in 1996. An on-site pre-construction meeting including representatives from DOE, DOT, the Contractor and other regulatory agencies, as appropriate, is also scheduled in order to review environmental protection requirements.

Grading construction during the winter months (typically December through March/April) is generally not allowed, because when the site is frozen, snow-covered, and/or wet, the quality of the work and the effectiveness of environmental protection measures are adversely affected. Authorization to carry out winter grading work on highway and bridge contracts must be obtained from the Director of Construction. Such authorization may specify types and locations of additional environmental protection measures required, and is subject to review by the Director of Construction based on changing site and weather conditions.

4.1 CLEARING

Discussion

This item consists of cutting and salvaging merchantable timber and disposing of all other trees, logs and brush. Areas to be cleared are indicated on the Plans or designated by the Engineer.

Protection Measures

- a) Buffer zones will extend a minimum of 30 m each side of a watercourse unless otherwise designated. In cases of steep grades or highly sensitive watercourses, buffer zones will be extended as required.

- b) Where possible all clearing shall take place during the winter months on frozen ground. Clearing shall only take place in areas identified on design drawings. When ground conditions are not suitable for heavy equipment and clearing is necessary within the 30 m watercourse buffer zone, clearing shall be performed such that soil is not exposed within the buffer zone.
- c) Watercourse crossings are to be avoided where possible. Equipment is not permitted to enter a watercourse other than at a recognized fording location. Stipulations for seasonal use of recognized fording locations are issued with the Watercourse Alteration Permit. To facilitate watercourse crossings at any other locations temporary bridges are to be used. There is to be no skidding of trees across watercourses except on temporary bridges.
- d) Non-merchantable timber, logs, and brush shall be disposed of by burning, hydroaxing, chipping, or placement in disposal areas outside the ROW, as described in Section 4.18 on disposal areas. Ornamental trees and shrubs shall not be disturbed without written permission from the Engineer. Tires shall not be used to start or maintain fires.

For merchantable timber, see Section 3.2.2.

- e) Trees shall be felled away from and not into or over a watercourse. Slash shall not be placed or left in watercourses. Brush, slash and other debris shall be piled away from the watercourse so that they do not wash into it during periods of high water.
- f) Where possible brush and trees outside the ditch area and within 30 m of the watercourse should be left to provide shade and a vegetated buffer.
- g) Salvaged material shall be removed from the ROW before the Completion Date of the Contract.
- h) Disposal areas shall be prepared, utilized, and cleaned up as stipulated in the section under Disposal Areas.
- i) The Contractor must obtain a permit from DOE and DNRE before starting to burn brush and slash. The Contractor must provide any materials or equipment necessary to control the burning operation. The Engineer may allow the Contractor to dispose of the material in disposal areas or by alternative means without burning if the Contractor presents to the Engineer a letter from the regulatory agencies stating that a burning permit cannot be obtained.

4.2 GRUBBING

Discussion

This item consists of the removal and disposal of roots and stumps.

Protection Measures

- a) Where the original ground is within 2.5 metres of the subgrade line in fill sections, roots and stumps shall be removed to disposal areas as directed by the Engineer.
- b) A 30 metre buffer zone shall be maintained on both sides of each watercourse within which no grubbing or filling takes place until the erosion control devices, and drainage structure are installed.
- c) Grubbing shall be carried out in accordance with the time limits and stabilization requirements of Work Progression (see Section 4.16).
- d) Grubbings shall be disposed of as follows:
 - (i) By tub-grinding the roots and stumps, along with any slash, brush and non-merchantable timber from the clearing operation.
 - (ii) By burying under fills over 5 m in height, tramped to a compact mass not more than 0.6 m above original ground.
 - (iii) By burning, if necessary permits are obtained and if burning is carried out and controlled in accordance therewith.
 - (iv) By placement in disposal areas, as stipulated in Section 4.18.

4.3 SEDIMENT CONTROL FENCE

Discussion

This item consists of the supply, installation, maintenance and removal of a Sediment Control Fence for the purpose of retaining suspended soil particles from sheet-flow run-off passing through it. Sediment control fence is illustrated in figure 3.4.

Protection Measures

- a) The Sediment Control Fence shall be a woven geotextile fabric on posts installed so as to handle the stress from sediment loading.
- b) Sediment Control Fence is not to be installed on top of a hill nor in a ditch as a sediment check dam; it is not intended to handle concentrated channel flow.
- c) Sediment Control Fence is to be located in a continuous fashion, perpendicular to the flow. It should be used in the following locations:
 - (i) to delineate buffer zones;
 - (ii) along the contours of exposed slopes;
 - (iii) at the toe of fill slopes (a few metres out from the toe of slope to allow for deposition);
 - (iv) the downhill side of large cut areas; and
 - (v) adjacent to streams.
- d) Sediment Control Fence(s) shall be maintained in a functional condition as long as necessary to contain sediment from run-off, from the time of installation until work under the contract is completed, including during shut-down due to weather during the winter months.
- e) Prior to winter shutdown, an on-site meeting shall be held between the Contractor and the Engineer to evaluate site conditions and identify specific requirements for erosion control to be implemented prior to spring runoff. The Contractor shall arrange for monitoring and maintaining Sediment Control Fence during winter shut-down.

- f) Additional fence, as approved by the Engineer, shall be installed before or during excavation and embankment construction, so as to effectively retain sediment from sheet-flow runoff.
- g) The geotextile shall be installed so that it extends 700 to 800 mm above the ground surface, and a minimum of 150 mm below the surface in a trench. Where a trench is impractical, as in ungrubbed areas, the bottom flap shall be flattened along the ground. In either case, earth shall be compacted over the bottom flap so that no flow can pass under the fence. Splicing of the geotextile shall be done only at posts.
- h) All Sediment Control Fences shall be inspected before and after each rainfall and at least daily during periods of prolonged rainfall.
- i) All Sediment Control Fences or parts thereof that are damaged shall be repaired immediately to the satisfaction of the Engineer.
- j) Retained sediment shall be removed when it has accumulated to a level approximately half the height of the fence, and shall be disposed of at a location at least 30 m from any watercourse and such that it cannot wash into a watercourse. Alternatively, the Contractor may install a second, back-up Sediment Control Fence with the approval of the Engineer.
- k) When deemed by the Engineer to be no longer required, the Sediment Control Fences(s) shall be removed. The Contractor shall dispose of any remaining sediment as described in (j) above, then dress and seed the area of the removed fence(s) and sedimentation, to the satisfaction of the Engineer.

4.4 EXCAVATION (COMMON, SOLID ROCK, UNCLASSIFIED)

Discussion

These items consist of excavation, placement and/or satisfactory disposal, in accordance with the Plans and Specifications, of material within the limits of the ROW. This includes preparation and construction of roadbed, embankments, slopes, side ditches, trenches, watercourses, intersections and private entrances.

Protection Measures

- a) Disposal areas shall be prepared, utilized, and cleaned up as stipulated in Section 4.18 on disposal areas.
- b) Exposed material resulting from earth cut and fill operations shall be stabilized according to the provisions in the Work Progression Clause (see Section 4.16).
- c) See Section 7.11 for protection measures related to acid-generating materials.
- d) Explosives shall be stored, handled, and used in accordance with both federal and provincial regulations and permits, and in such a manner as to reduce potential environmental risks.
- e) Blasting near watercourses is to be conducted in accordance with the Guidelines for the Use of Explosives in Canadian Fisheries Waters. Contact DFO, Habitat Management Division Chief (see Appendix A), as early as possible to identify resources at risk and to develop an effective mitigation plan.

4.5 EROSION CONTROL STRUCTURES (CHECK DAMS)

Discussion

This item consists of the installation and maintenance of Erosion Control Structures (Check Dams) in accordance with the Plans or as directed by the Engineer.

The types of erosion control structures are as follows (see Figures 3.1 to 3.4):

Type "A" Check Dams - Spillway for Sediment Pond Dykes;
Type "B" Check Dams - Riprap Erosion Control for Ditches; and
Type "C" Check Dams - Straw Bale Erosion Control for Ditches.

Protection Measures

- a) Erosion Control Structures shall be constructed in a manner and at locations as specified in the Plans or as directed by the Engineer.
- b) Random riprap shall be placed in such a manner that the underlying geotechnical fabric and ground are not disturbed.
- c) Type "A" Check Dams shall be constructed of geotechnical fabric and Random Riprap "R-25" at the location of the highway ditches, prior to grubbing of areas where excavation of earth is to be carried out, to act as the spillway of a sediment pond dyke.
- d) Type "B" Check Dams (Riprap Erosion Control for Ditches) shall be constructed of geotechnical fabric and Random Riprap "R-5" at specified locations in a rock ditch, after the ditch has been constructed to grade.
- e) Type "C" Check Dams (Straw Bale Erosion Control for Ditches) shall be constructed of geotechnical fabric, straw bales and Random Riprap "R-5" at specified locations in an earth ditch.
- f) Erosion Control Structures shall be monitored regularly and maintained in a functional condition until the grass on seeded slopes is sufficiently established to be an effective erosion deterrent, or until the Engineer authorizes any or all of them removed. Such monitoring and maintenance shall be performed on contracts that are carried over to the next construction period whether the Contractor is working or shut down for the winter.

- g)** Prior to winter shutdown, an on-site meeting shall be held between the Contractor and the Engineer to evaluate site conditions and identify specific requirements for erosion control to be implemented prior to spring runoff. The Contractor shall arrange for monitoring and maintaining Erosion Control Structures during the winter shut-down.
- h)** All Check Dams shall be inspected before and after each rainfall and at least daily during periods of prolonged rainfall.
- i)** All Check Dams that are found to be damaged shall be repaired immediately so that proper functioning of the structures is resumed to the satisfaction of the Engineer.
- j)** Sediment deposits retained by Types "B" and "C" Structures shall be removed when the level of sedimentation is within 100 mm of the top of the structure, or as directed by the Engineer. The excavated sediment shall be disposed of at a location approved by the Engineer, at least 30 m from a watercourse and such that it cannot wash into a watercourse.

4.6 EROSION CONTROL STRUCTURE REMOVAL

Discussion

This section covers the removal of erosion control structures previously installed as a protection measure during construction and that are now deemed unnecessary or ineffective. The procedure for removal shall be directed as per the contract or by the Engineer.

Protection Measures

- a) When deemed by the Engineer to be no longer required, Erosion Control Structures should be removed by use of an excavator, or other acceptable method approved by the Engineer, so that all erosion control materials and any retained sediment are excavated with minimal disturbance of the underlying ditches or slopes.
- b) Removed materials and sediment shall be disposed of at a location approved by the Engineer, at least 30 m from a watercourse and such that it cannot wash into a watercourse.
- c) Upon removal of the erosion control structure materials and retained sediment, the affected ditches and slopes shall be shaped to match into adjacent final ditch and slope grades and immediately seeded as approved by the Engineer.

4.7 MULCHING

Discussion

This item consists of the supply and application of hay or straw mulch on slopes and other exposed ground as a temporary measure to prevent erosion of the exposed ground and the siltation of watercourses.

Protection Measures

- a) Mulch shall be one and/or the other of the following:
 - (i) unprocessed hay or straw in rolls or bales, reasonably free of noxious weeds and other undesirable material, and not so wet, decayed or compacted so as to inhibit even and uniform spreading, or,
 - (ii) processed Verdyol Standard Mulch or Biomulch (shredded straw or hay), or approved equivalent.
- b) Binder (tackifier) may be supplied in liquid, powder or flake form, and shall be non-toxic.
- c) Mulching shall be carried out at locations identified on Plans or as directed by the Engineer, in accordance with Section 4.16 on Work Progression and Section 4.17 on environmental requirements.
- d) All mulching shall require binder, except mulching placed by hand or applied very late in the year when ground conditions or freezing temperatures inhibit the application of binder.
- e) Unprocessed hay or straw mulch shall be spread evenly and uniformly over the designated areas, at a rate of 4500 kg/ha +/- 15 percent. Lumps and thick clumps of mulch shall be thinned. Binder shall be sprayed uniformly over the mulched ground at the binder manufacturer's recommended application rate, in a solution of water and enough green dye or green-coloured wood-fibre to identify the areas covered.
- f) Processed straw mulch shall be mixed in a hydroseeding unit with water and binder at the manufacturer's recommended application rate, sprayed evenly and uniformly over designated areas at a rate of 2400 kg/ha +/- 15 percent.

- g)** Rough ground and/or steep slopes require more mulch and binder per hectare than finished and/or flatter ground. Therefore quantities shall be adjusted as required to ensure that the specified application rates are achieved. Where the soil is fine and of high silt and/or moisture content, riprap may be required as a long-term protective measure.
- h)** The mulch shall be monitored and maintained by repairing all damaged mulch and by remulching bare spots resulting from the shifting of mulch by wind, water or other causes. This will include adding additional mulch as required.

4.8 HYDROSEEDING

Discussion

This item consists of applying a mixture of seed, fertilizer, mulch, binder and water on foreslopes, backslopes, ditches and other prepared areas designated by the Engineer, to produce a uniform cover of grasses.

Protection Measures

- a) The Seed Mix consists of clover, for its nitrogen-fixing property and deep root system, annual rye grass as a "nurse" crop, and a variety of other drought-resistant and short-growing grasses that survive in poor soils. The mix shall be as follows:

10% Canada Bluegrass
20% Hard Fescue
45% Creeping Red Fescue
10% Alsike Clover
10% Annual Ryegrass
5% Colonial Bentgrass

Each species shall meet or exceed the Canadian Grade Standards for Common No. 1 seed.

- b) Fertilizer shall be a 15-25-15 (N-P-K) mix for seeding done May 1st to Labour Day, the prime growing season, and 10-20-20 from Labour Day until the end of the last week of September.
- c) Hydraulic mulch shall be a product made primarily for hydroseeding, comprised of shredded wood fibres or shredded newsprint coloured green with an environmentally acceptable dye, or shredded straw products such as Biomulch or Verdyol. Mulch shall not contain growth-inhibiting chemicals or compounds.
- d) Binder (tackifier) may be supplied in liquid, powder or flake form.
- e) Hydroseeding shall be carried out within 48 hours after completion of the surface preparation. Final dressing of slopes and other exposed earth shall be done as cut and fill areas are completed, to enable seeding to be done in stages as work progresses in accordance with Section 4.16 on Work Progression.

- f) Hydroseeding will not be permitted on hardened or eroded soil. Areas to be hydroseeded shall be backdragged or otherwise left in a loosened condition to lines and grades approved by the Engineer, and free of ruts, ridges and deleterious materials such as weeds, sticks, roots and large rocks which would impede growth of the seed mix and mowing. If topsoil is to be utilized, it shall be placed in accordance with the protection measures for topsoil (see Section 4.13).

Travelling up and down slopes with tracked equipment prior to hydroseeding will help to retain the seed.

- g) Hydroseeding types and uses are as follows:
- (i) Hydroseeding A utilizes 1350 kg/ha of hydraulic mulch in the mix. It is a one step process acceptable between May 1st and Labour Day;
 - (ii) Hydroseeding B consists of hydroseeding (utilizing only 350 kg/ha of hydraulic mulch in the mix) followed within 48 hours by application of hay or straw mulch and binder. Hydroseeding B may be used in lieu of Hydroseeding A, May 1st to Labour Day, such as in dry periods (the hay/straw mulch retains soil moisture, enhancing germinating) or wet periods (the mulch protects against erosion). After Labour Day, only Hydroseeding B is acceptable, because the hay/straw mulch protects against erosion by fall rains and insulates the seeded ground against lower fall temperatures.
- h) No hydroseeding shall be carried out after the week of September 30th without the approval of the Director of Construction Branch.
- i) Hydroseeding shall not be performed under windy conditions or during periods of rainfall, in standing water, or under other adverse conditions, as determined by the Engineer.

4.9 BORROW

Discussion

This item consists of supplying, loading, hauling and satisfactorily placing additional material necessary to complete embankments to subgrade and other features of the work. Materials shall be obtained outside the limits of the ROW.

Protection Measures

- a) Borrow shall be supplied by the Contractor after being approved by the Engineer as to location and suitability.
- b) Maximum allowable percent passing the 75 mm sieve size shall be 50%, unless otherwise specified in the Specifications.
- c) The borrow pits will be developed and operated in accordance with all applicable provincial guidelines, policies, acts, and regulations.
- d) Shaping shall be carried out as the embankment progresses so as to ensure that surface drainage is maintained at all times. Embankments shall be properly graded or maintained as soon as possible unless otherwise authorized by the Engineer. Erosion control structures shall be installed where necessary to prevent sediment transport.
- e) Erosion control measures for pits and quarries, and any damage resulting therefrom, are the Contractor's responsibility.
- f) Borrow pits must be left in a neat and safe condition free from overhanging banks. The pits must be left in such a condition that they comply with legislation regarding pits and quarries (NB Occupational Health and Safety Act).

4.10 FOUNDATION EXCAVATION (CASES A and B)

Discussion

Case (A)

This item consists of excavation and satisfactory disposal of material, not classified as Foundation Excavation Solid Rock, necessary for removal of existing culverts and/or erection of highway structures to dimensions shown on the Plans.

Case (B)

This item consists of excavation and satisfactory disposal of boulders 0.3 m³ and over, rock "in situ", old Portland cement concrete, stone masonry and rock necessary for the erection of highway structures to the dimensions shown on the Plans.

Protection Measures

- a) Shoring, bracing, sheeting, pumps, temporary roads and bridges, considered necessary by the Engineer, shall be supplied, employed and removed by the Contractor when no longer required, as outlined in the contract document.
- b) Unsuitable or surplus material taken from excavation shall be used or removed as stipulated in the section under Disposal.
- c) Explosives shall be stored, handled, and used in accordance with both federal and provincial regulations and permits, and in such a manner as to reduce potential environmental risks.
- d) Blasting near watercourses, including marine shore drainage areas, is to be conducted in accordance with the Guidelines for the Use of Explosives in Canadian Fisheries Waters. Contact DFO, Habitat Management Division Chief, as early as possible to identify resources at risk and to develop an effective mitigation plan.

4.11 AGGREGATE BASE/SUBBASE

Discussion

This item consists of supplying and placing any gravel or rock base/subbase obtained from a pit or quarry operation. Sandstone is used for subbase but not for base.

Protection Measures

- a) Base/subbase shall be composed of clean, hard, durable, uncoated particles free of lumps of clay or other deleterious material.
- b) Pits and quarries will be developed and operated in accordance with all applicable provincial guidelines, policies, acts, and regulations.
- c) Prior to excavating for base/subbase from an approved location, the area to be worked shall be cleared, grubbed and stripped of all suitable surface materials (see Sections 4.1, 4.2, and 4.3). A sufficient area shall be opened ahead of the excavating operation to prevent contamination of the base/subbase by deleterious materials. Erosion control measures for pits and quarries, and any damage resulting therefrom, are the Contractor's responsibility as per Item 948.2.1.6 of the Standard Specifications.
- d) Pits and quarries must be left in a neat and safe condition free of overhanging banks. The pits must be left in such a condition that they comply with legislation regarding pits and quarries (NB Occupational Health and Safety Act).
- e) Blasting near watercourses, including marine shore drainage areas, is to be conducted in accordance with the Guidelines for the Use of Explosives in Canadian Fisheries Waters. The DFO, Habitat Management Division Chief, should be contacted as early as possible to identify resources at risk and to develop an effective mitigation plan.

4.12 CRUSHING AND SCREENING

Discussion

This item consists of processing approved materials through crusher(s) and screen(s) to obtain crushed materials conforming to grading limits of desired aggregates.

Protection Measures

- a) Gravel, rock, or sandstone shall be supplied by the Contractor as per contract Specifications, and shall be composed of clean, hard, sound, durable particles.
- b) When the Contractor supplies the material in a crushing contract, washing residue becomes the property of the Contractor, who shall dispose of it in an environmentally safe manner, as stipulated in Section 4.18 on disposal areas.
- c) All washing equipment shall be approved by the Engineer before being used.
- d) Where aggregates are washed, the dust-laden water shall be allowed to pond in the pit operation or settle out in a sedimentation pond.
- e) Any water discharged from the pit or sedimentation pond within 30 m of a watercourse must meet sediment discharge requirements, as outlined in Section 4.17 on environmental requirements.
- f) In populated areas or adjacent to sensitive watercourses, airborne dust shall be controlled as much as possible.
- g) Pits must be left in a neat and safe condition free from overhanging banks. The pits must be left in such a condition that they comply with legislation regarding aggregate pits (NB Occupational Health and Safety Act).

4.13 TOPSOIL

Discussion

This item consists of placing topsoil in areas designated in the Specifications or by the Engineer, and includes topsoil salvaged on site and/or topsoil from off site.

Protection Measures

- a) Topsoil shall be fertile, friable soil of loamy character typical of topsoil in the locality and shall contain a normal amount of organic matter. Topsoil shall be reasonably free of large stones, large clods, roots of trees or shrubs or other foreign matter.
- b) Topsoil stockpiles shall be located a minimum of 30 m from any watercourse, in areas approved by the Engineer, where they will not block natural drainage or be a potential source of siltation of watercourses. Stockpiles shall be mulched in accordance with the Work Progression Clause and sediment control fences may be used to contain sediment in runoff.
- c) Slopes and other areas where topsoil is required shall be trimmed and shaped to required grade and scarified or otherwise loosened to a depth of 50 mm before placing topsoil.
- d) Topsoil shall be spread on the prepared areas to a depth of 100 mm +/- 25 mm. Remaining large clods, roots and stones above 75 mm in greatest dimension shall be removed for disposal. Topsoil shall be brought to a true even surface meeting the required grade.
- e) Areas covered with topsoil shall be hydroseeded (Section 4.8) in accordance with the Work Progression Clause (Section 4.16).

4.14 DUST CONTROL

Discussion

Water trucks are used to apply water on construction projects for dust control.

Protection Measures

- a) Streams are selected that contain sufficient flow such that the withdrawal rate will not noticeably reduce the flow in the stream. A stream that is a good source during most of the year may not have sufficient flow during the summer to permit any withdrawal. It is best to select a large pond or lake to use during a dry period.
- b) Rock and gravel may be moved by hand to obtain a pool for a suction pipe, but a backhoe, bulldozer, or other earth moving equipment is not to be used in the stream.
- c) Water trucks are not driven into or through the stream.
- d) Water trucks are not driven down to the edge of the watercourse, unless the area is firm, so that ruts will not form. Any disturbed ground or ground cover is covered with mulch or other erosion control material.
- e) Pumps and other equipment must not be repaired or refuelled within 30 m of a watercourse.
- f) Intake hoses are effectively screened.

4.15 ASPHALT CONCRETE

Discussion

This item consists of supplying aggregates, production, loading, hauling, placing, and compaction of conventional hot mix asphalt concrete and hot mixed, recycled asphalt concrete for pavement construction and other uses.

Protection Measures

- a) The asphalt plant and other facilities shall be operated in such a manner so as to safeguard the air and water resources by controlling or mitigating environmental pollution in accordance with the Clean Environment Act, the Clean Water Act, and other relevant Legislation.
- b) All necessary permits and/or approvals shall be obtained for the operation.

4.16 WORK PROGRESSION

Discussion

The purpose of this clause is to have work on a contract carried out in a manner such that construction which begins in any Work Area shall proceed continuously and diligently until it is completed, to ensure an orderly progression of the work and effective protection of the environment.

A Work Area covers any excavation and/or embankment whose limits shall be indicated by the Contractor in writing before work begins. The size of each Work Area shall be based, as far as practicable, on the premise of completing and stabilizing OM excavation and embankment work therein within 30 calendar days. The 30-day period shall begin the day that stripping/cut/fill construction begins, or one week from the commencement of grubbing, whichever occurs first.

Protection Measures

- a) Stabilization shall mean hydroseeding and/or mulching of OM that has been exposed by grubbing, stripping (removal of topsoil and unsuitable subsoils) or cut/fill construction. Stabilization shall be carried out by the end of the 30-day period, as follows:
 - (i) Completed OM cuts and fills shall have ditches and slopes shaped to lines and grades, and hydroseeded. If the OM cuts/fills within a Work Area are not completed in 30 days, construction shall be carried out in a manner such that by the thirtieth day, the portions that have been constructed are shaped and hydroseeded. This would include OM ditches, OM slopes in partially excavated OM cuts, OM slopes at the top of rock backslopes, OM foreslopes of partially completed fills, and stripped areas beyond the tops or toes of slopes. After the initial 30 days, for every successive 30 days that cuts/fills in the Work Area are under construction, shaping and hydroseeding as described above shall be carried out.
 - (ii) Grubbed or stripped areas which have not been under continuous cut/fill construction during the 30-day period, and which in the Engineer's opinion have the potential to be washed into a watercourse, shall be mulched by the end of the 30-day period.
 - (iii) Cuts shall be excavated such that any runoff is directed to one or two exit points and controlled by sediment dams and/or silt fence. If such runoff could find its way to a natural watercourse, any exposed OM other than the working face and floor of the cut which would contribute to the runoff shall be mulched.

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- (iv) If the Contractor temporarily ceases construction in a Work Area leaving cuts/fills uncompleted, all exposed OM which has the potential to be washed into a watercourse shall be mulched by the end of the 30-day period or the seventh day after abandonment, whichever is sooner.
 - (v) Embankments at natural watercourses shall be stabilized in accordance with the Environmental Requirements (see Section 4.17 herein and Item 948 of the Standard Specifications).
- b) Shaped areas which are damaged by precipitation, runoff or slope failure after the Engineer's approval of the shaping but before hydroseeding has been done, shall be repaired immediately by the Contractor before hydroseeding will be allowed to commence.
 - c) Shaped areas which are similarly damaged after completion of hydroseeding (or in the case of Hydroseeding B, after completion of hydroseeding and mulching) shall be reshaped and hydroseeded as directed by the Engineer.
 - d) Failure of the Contractor to complete and/or stabilize exposed work areas as specified herein may result in the Contractor being charged a penalty for every day that such stabilization remains uncompleted following the 30th day of work or the seventh day after abandonment of the work in a work area, whichever is sooner.

4.17 ENVIRONMENTAL REQUIREMENTS

Discussion

Appropriate environmental protection measures are incorporated into the design of a highway project, and are detailed on the Plans and in the Specifications of the tender documents, and shall be monitored for effectiveness throughout the term of the contract.

Implementation of an environmental compliance monitoring program ensures that pre-construction commitments are met, while preventative and protective environmental measures are in place throughout construction.

Environmental effects monitoring (EEM) is intended to assess the accuracy of any predictions made concerning environmental impacts during the impact assessment. This process involves the comparison of pre-construction data with present and post-construction data.

Protection Measures

- a) Work on the contract shall be carried out according to the Plans and Specifications or as directed by the Engineer and in such a manner to be in compliance with the various federal and provincial acts and regulations concerned with the protection of the environment, and any approvals or permits issued to DOT or the Contractor in accordance therewith.
- b) A copy of the Watercourse Alteration Permit for the project is to be kept on site at all times and all DOT and Contractor personnel are to be familiar with the stipulations within it, as well as any documents referred to in the permit.
- c) All sediment and erosion control measures shall be carried out as detailed on the Plans and included in the Specifications.
- d) Any debris and excavated material shall be removed from the watercourse and adjacent areas for disposal or placement in a manner such that it cannot be returned to the watercourse.
- e) All necessary precautions shall be taken to prevent discharge or loss of any harmful material into a watercourse, including but not limited to creosote, hydrocarbons, biocides, asphalt concrete, asphalt emulsion, paint, lime, cement, or fresh concrete.

- f) Within buffer zones shown on the Plans (a minimum of 30 m on both sides of each natural watercourse), no grubbing, excavation, embankment construction or installation of drainage structures shall take place until the appropriate sediment control fence and erosion control structures are installed as per the Plans or as directed by the Engineer to ensure that runoff, by the time it reaches a watercourse, does not have a suspended solids level in excess of 25 mg/L (monthly average) or 50 mg/L (grab sample).
- g) Within a buffer zone, any temporary access roads and working areas constructed for the installation of a drainage structure shall, on the same day they are constructed, be surfaced with clean gravel or rock in a quantity sufficient to provide environmental protection from the underlying OM. It will be the Contractor's responsibility to build the access roads and work areas on which this clean gravel or rock is placed sound enough to carry the construction equipment and loads to which they will be subjected.
- h) Where possible, drainage from temporary access roads shall be directed into vegetation or a sediment pond within the buffer zone and not into the watercourse. This will allow filtering of sediment prior to water entering the watercourse.
- i) In dewatering an excavation, whether a roadway cut, foundation excavation, a pit, or a quarry, the Contractor shall ensure that suspended solids in the discharged water will not exceed a grab sample level of 50 mg/L or a monthly average of 25 mg/L, or a level approved by DOE at the watercourse. The effluent and receiving water should be monitored to verify the effectiveness of the suspended solids treatment. Any erosion control measures required to achieve this for roadway and foundation excavations shall be built in accordance with and measured for payment under the appropriate bid items. Erosion control measures for pits and quarries, permission to pump or release any turbid water onto private property, and any damage resulting therefrom, are the Contractor's responsibilities.
- j) All earthwork shall be carried out in accordance with the "Work Progression" clause of the contract. Extra erosion control measures in addition to those specified in the Plans shall be installed as requested by the Engineer and measured for payment under the appropriate bid item. All erosion control measures shall be monitored for effectiveness throughout the term of the contract.
- k) All instream work shall be carried out between June 1st and September 30th. The Resident Engineer shall be notified by the Contractor, in writing, at least seven days prior to commencement of instream work.
- l) The Resident Engineer, upon receiving notice from the Contractor as to when construction will actually commence, will arrange an on-site meeting, with as much advance notice as possible, with the Contractor and representatives from DOE and DFO prior to commencement of the work.

- m) Additional conditions of approval specified in a Watercourse Alteration Permit issued to DOT for the contract shall be carried out by the Contractor as stipulated in the Particular Specifications.
- n) Monitoring programs will be implemented to assess the effectiveness of environmental protection measures, and to assess recovery trends and areas that may require additional environmental protection measures and/or further study. If concerns or problems are identified, site-specific rehabilitation programs will be established as appropriate.
- o) Compliance monitoring will be performed by DOT personnel, who will be familiar with the applicable regulations and will ensure that activities are planned and conducted with the knowledge and understanding of DOT Specifications.
- p) Failure of the Contractor to carry out the work in accordance with the Environmental Requirements of the Specifications, including any permits obtained for the contract, will result in his being liable for any charges made under federal or provincial environment-related acts or regulations, and may result in suspension until the Contractor commences the work as specified and/or takes remedial measures to repair or compensate for any environmental damage resulting from his inaction or improper actions carrying out the work.

4.18 DISPOSAL AREAS

Discussion

Disposal areas for waste and /or surplus material shall be located at least 15 metres outside the highway ROW or clearing line, as approved by the Engineer. Contractors shall obtain permission from the property owners on whose land they wish to place disposal areas.

Protection Measures

- a) Disposal areas should be located carefully, taking into consideration the siting constraints identified in Section 3.2.1.
- b) Disposal areas shall not be located so as to block natural drainage.
- c) Disposal areas shall be located no closer than 30 metres from a watercourse and where runoff from the disposal area cannot enter a watercourse or cause siltation of the watercourse. Additional setback requirements may apply in protected watersheds and designated groundwater protection areas, or may be warranted by site-specific conditions.
- d) The minimum distance between the entrances of two disposal areas on the same side of the highway is 150 metres or as specifically altered by the Engineer in writing.
- e) Disposal areas shall be left in a neat and finished appearance and immediately hydroseeded or mulched, to the satisfaction of the Engineer.
- f) The entrance to a disposal area shall be at 90 degrees to the centerline of two-way highways and at an angle opposing the flow of traffic on divided highways.
- g) Trees which are partially buried by material in the disposal area shall be cut and removed or laid down and the material in the disposal area dressed and left with a neat finished appearance to the satisfaction of the Engineer. Windrows of earth and debris on either side of the disposal area entrances shall be removed or flattened and the entrances shaped and hydroseeded.
- h) Protection measures (including those related to Construction Activities) for Areas of Special Environmental Consideration are outlined in Section 7.

4.19 STORAGE, HANDLING, AND TRANSFER OF FUELS AND OTHER HAZARDOUS MATERIALS

Discussion

DOT and Contractor personnel shall be responsible for the safe handling and storage of fuels and hazardous materials used during construction and maintenance. Gasoline, diesel fuel, grease and oil are needed for equipment; explosive materials may be used for rock removal; solvents may be used for cleaning.

Protection Measures

- a) All necessary precautions shall be taken to minimize the spillage, misplacement, or loss of fuels and other hazardous materials used during construction and maintenance operations (see Section 6).
- b) All petroleum storage tank systems must be registered under and in compliance with the Petroleum Product Storage and Handling Regulation - Clean Environment Act (New Brunswick Regulation 87-97) before commencing operation. Registration does not apply to sites with a total capacity less than 2000 litres. However, petroleum storage tanks located on federal lands must be registered under the Registration of Storage Tank Systems for Petroleum Products and Allied Petroleum Products on Federal Lands Regulations, 1997 in accordance with the Canadian Environmental Protection Act (CEPA).
- c) Oils, grease, gasoline, diesel and other fuels shall be stored at least 30 metres from any watercourse and at a location where any loss of product cannot enter a watercourse, unless otherwise approved.
- d) Handling and fuelling procedures shall be such that contamination of ground or water shall not occur.
- e) Any above-ground fuel container, with the exception of those exempted under New Brunswick Regulation 87-97, shall be positioned over an impervious mat and shall be surrounded by an impervious dyke of sufficient size to contain not less than 110% of the capacity of the tank, plus 150 mm of freeboard.
- f) Only approved, portable containers may be used for collecting and transporting gasoline.
- g) Fuel storage areas and non-portable transfer lines shall be clearly marked or barricaded to ensure that they are not damaged by moving vehicles. The markers should be visible under adverse weather conditions.

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- h)** Waste oils and lubricants, etc. shall be retained in a clearly labelled tank or closed container, and recycled or disposed of at an approved facility.
 - i)** Storage tank systems shall be inspected on a regular basis as per Section 65 of New Brunswick Regulation 87-97. This involves, but is not limited to, gauging or dipping, and reconciliation of records to be properly maintained for two years.
 - j)** All spills of hazardous materials including fuel or oil shall immediately be reported to the Coast Guard (telephone 1-800-565-1633) and cleaned up in an acceptable manner (see Section 8.1).
 - k)** Smoking shall be prohibited within 10 m of a fuel storage area.
 - l)** Fuelling or servicing of mobile equipment shall not be allowed within 30 m of a watercourse.
 - m)** Notwithstanding any requirements under New Brunswick Regulation 87-97, the owner of a storage tank system shall, within 30 days of known abandonment, notify DOE, empty the system of all products, remove the tank and associated piping from the ground, remove any contaminated soil, and leave the premises in a neat and clean condition. The DOE shall be notified to inspect the removal of soil contaminated by petroleum. Contaminated soil shall be removed and remediated or disposed of at an approved facility.
 - n)** Hazardous waste is to be dealt with in compliance with federal and provincial regulations.
 - o)** Explosives shall be stored, handled, and used in accordance with both federal and provincial regulations, guidelines, and permits, and in such a manner as to reduce potential environmental risks and adverse impacts on fish, shellfish, marine mammals, migratory birds, species at risk, and their habitat. Contact DFO, Habitat Management Division Chief, or the Canadian Wildlife Service of Environment Canada, as appropriate, as early as possible to identify resources at risk and to help in the accomplishment of effective mitigation.

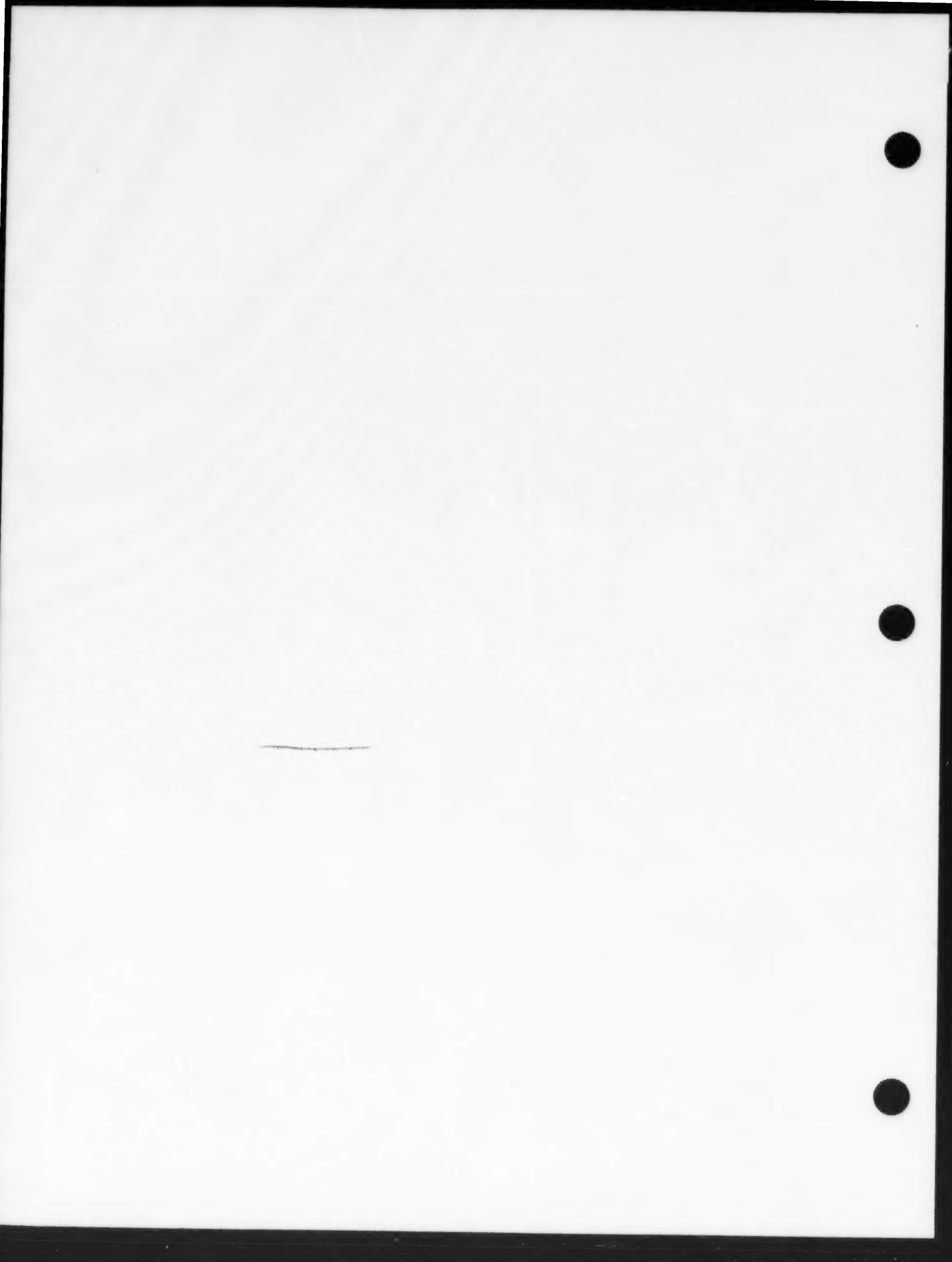
4.20 CONSTRUCTION WORK CAMPS

Discussion

Contractors may find it necessary to install temporary work camps for their employees during construction depending on project accessibility, distance from existing accommodations, and the cost of alternative accommodations.

Protection Measures

- a) The Contractor is responsible for obtaining all appropriate permits from government agencies with legislation and regulations relevant to camp facilities. These permits include but are not necessarily limited to those related to solid and liquid waste disposal, water supply, sewage treatment, development control, and crown lands.
- b) The Contractor should minimize the area to be cleared for temporary construction camps and should utilize existing cleared areas wherever possible.
- c) Camps shall not be located within 100 m of any watercourse unless otherwise approved by DOT or other government agencies.



SECTION 5: STRUCTURES

SECTION 5: STRUCTURES

With over 2800 structures such as grade separations, interchange structures, watercourse crossings, seawalls, wharves, and major (≥ 3 m) culvert installations, structures are an integral part of the province's highway network.

5.1 STRUCTURE LOCATION

Discussion

Major highway projects go through an extensive planning and design phase during which the highway corridor and final route location (including the location of structures and bridges) is established taking into consideration the proper balance of engineering, environmental, social, and economic considerations.

Protection Measures

- a) Environmental protection is considered throughout the highway planning phase (Section 3.1).
- b) Protection measures for route location and geometric design of a highway are outlined in Sections 3.2.1 and 3.2.4.
- c) Protection measures (including those related to Highway Planning and Design) for Areas of Special Environmental Consideration are outlined in Section 7.

5.2 STRUCTURE DESIGN

Discussion

The design of watercourse crossing structures and their components are affected by numerous environmental factors and controlling features such as:

- wetlands;
- hydrology;
- navigation requirements;
- fish habitat;
- fish passage requirements;
- stream channel and bank material;
- flood risk and ice protection considerations;
- hydraulics;
- foundation conditions;
- alignment considerations;
- watercourse alteration regulations;
- agricultural lands;
- flora and fauna;
- economics; and
- socio-economic considerations.

Protection Measures

- a) Culverts, bridges, and marine structures are designed with consideration of the requirements of the "Watercourse Alteration Technical Guidelines" of DOE and may incorporate site-specific requirements of DNRE, DOE, and DFO. Approval under the Navigable Waters Protection Act is obtained for structures crossing navigable water.
- b) Fish passage facilities receive approval pursuant to Section 20 of the federal Fisheries Act. Design is undertaken in consultation with DFO, DNRE, and DOE. Design standards for fish passage facilities are contained in the document "Fish Passage and Habitat Preservation for Highway Culverts, Eastern Canada, Vern Conrad and Hans Jansen, January 1996".

5.3 CULVERT INSTALLATION

Discussion

The installation of culverts is carried out during the highway construction process in accordance with the requirements specified in the Watercourse Alteration Permit.

Protection Measures

- a) A copy of the Watercourse Alteration Permit for the project is to be kept on site at all times and all DOT and Contractor personnel are to be familiar with the stipulations within it, as well as any documents referred to in the permit.
- b) Construction activities are normally separated from the flow of the stream. This may be done by diverting the watercourse around the construction site using plastic-lined diversion channels, culverts, or pumping. Sometimes the culvert is located away from the existing stream channel(s) so it can be constructed without interfering with the natural stream flow. When the culvert is completed, the watercourse is diverted through the culvert via the new stream channel leading to the culvert inlet and away from the culvert outlet back to the natural watercourse. New stream channels must be designed in consultation with DFO and DNRE.
- c) The inlet and outlet of the culvert may have concrete headwalls and appurtenances for protection against scour. The velocity of the water exiting the culvert may be reduced by use of baffles (energy dissipators) in the culvert or concrete baffles, mixed riprap or stilling pools at the outlet end of the culvert.
- d) The design of new streambeds and banks is done in consultation with DFO and DNRE. The inlet and outlet of the culvert, and any new stream channels are stabilized against erosion by the use of riprap, gabions, geotechnical fabric, seeding, mulching or a combination of these. New streambeds are sometimes lined with appropriate clean granular material such as riprap and gravel. Cleared banks are also sometimes planted with wood vegetation to provide shade. The vegetation should be alders, willow, or poplar, if possible.
- e) Earth fill slopes each side of a culvert in a fish-bearing watercourse, for a distance of 25 to 75 m, depending on topography and culvert size, shall be faced with clean rock (typically 50 to 250 mm in size) to an elevation of 4 m above the invert of the culvert or to the subgrade shoulder, whichever is less. Above the 4 m height and for the same distance each side of the culvert as the rock protection, the earth slopes shall be mulched by the end of each day's fill construction, and when final-shaped, should be covered with jute matting prior to hydroseeding.

- f) Blasting near watercourses is to be conducted in accordance with the Guidelines for the Use of Explosives in Canadian Fisheries Waters. Contact DFO, Habitat Management Division Chief, as early as possible to identify resources at risk and to develop an effective mitigation plan.

5.4 CONSTRUCTION OF FOUNDATIONS, PIERS, ABUTMENTS, AND SUPERSTRUCTURES

Discussion

The construction of DOT structures located on land is usually straightforward and creates a minimum of environmental concern provided excavated material, construction materials and pollutants are prevented from entering a watercourse or wetland. Foundation work in or adjacent to a watercourse or wetland is more complex and often requires site-specific environmental protection measures which are determined in consultation with the appropriate provincial and federal departments or agencies.

Protection Measures

- a) A Watercourse Alteration Permit is obtained by DOT prior to any construction activity and work is carried out in accordance with the terms and conditions of the permit including those associated with crossing navigable waters. A copy of the Permit is to be kept on site at all times and all DOT and consultant personnel are to be familiar with the stipulations and conditions within it, as well as any documents referred to in the permit.
- b) Excavation for foundations in a watercourse is required to be done in a manner that keeps siltation to a minimum. This may require the use of cofferdams, silt screens, special pumping procedures, special excavation equipment, watertight barges, and watertight trucks. Excavation is seldom permitted in the flowing stream.
- c) Methods of accessing a foundation site in a major watercourse often involve the use of a temporary trestle. Navigation requirements and the potential effects of temporary trestles on ice movement and ice jams are investigated and taken into consideration in both the design and construction of any trestle work.
- d) Fresh concrete, asphalt concrete, paint, creosote, fuels and hydrocarbons are not to be discharged into a watercourse.
- e) If riprap intended for scour protection is suspected of being acid-generating or containing contaminants such as heavy metals or arsenic, it is first tested to ensure that such properties are within acceptable limits.
- f) Blasting is to be conducted in accordance with the Guidelines for the Use of Explosives in Canadian Fisheries Waters. Contact DFO, Habitat Management Division Chief, as early as possible to identify resources at risk and to develop an effective mitigation plan.
- g) Noise from pile driving work adjacent to residential developments may require restrictions to work scheduling and time frames.

5.5 DETOUR CONSTRUCTION

Discussion

The construction of structures and bridges often requires the necessity for diverting traffic around the site under one of the following conditions:

- using the existing structure and placing the new structure on a new alignment so that no detour is required;
- detouring traffic around the site by use of existing roadways; and
- constructing a temporary detour adjacent to the construction site.

Protection Measures

- a) DOT assesses a temporary detour structure with respect to the watercourse hydrology, construction timing, fish passage, navigation, stream channel material, bank material, type and size of temporary structure, and overall costs in consultation with appropriate regulatory agencies.
- b) Approach fills of temporary detour structures are stabilized against erosion by the use of either geotechnical fabrics, riprap, plastic sheets, mulching or a combination of these materials. The approaches are constructed such that they do not encroach on the natural channel.
- c) Scheduling of work within 30 m of a watercourse will be in accordance with requirements specified in the Watercourse Alteration Permit.
- d) No temporary infilling of any portion of a watercourse is to be carried out during the construction of a detour, unless authorized in the Watercourse Alteration Permit.
- e) The deposition or use of contaminants in or near a watercourse is prohibited. Precautions are necessary to minimize sediment entry into the watercourse.
- f) Approach fills of detours are sometimes placed on geotechnical fabric to reduce mixing of existing ground material with fill material and to facilitate removal of fill material and to help clean up the site after the detour is no longer required.
- g) Abandoned detour sites are cleaned up, and approaches and streambanks are stabilized by seeding and mulching, placing of riprap, or a combination of these.

**SECTION 6: OPERATION AND MAINTENANCE
ACTIVITIES**

SECTION 6: OPERATION AND MAINTENANCE ACTIVITIES

Maintenance of the highway infrastructure is broken down into four categories:

- Summer highway maintenance - activities to maintain roadways at a reasonable level of service, comfort, and safety.
- Winter highway maintenance - activities involving tasks associated with snow and ice control.
- Bridge maintenance - activities to maintain the structural integrity of the bridge structures.
- Ferry operations - activities associated with the operation of self-propelled and cable ferries.

6.1 SUMMER HIGHWAY MAINTENANCE AND RELATED ACTIVITIES

6.1.1 Patching and Levelling

Discussion

Patching is undertaken to repair potholes, depressions, ruts, bumps, and distorted surfaces on paved and surface - treated highways.

Protection Measures

- a) DOT personnel are careful to minimize the volume of waste materials. Surplus materials are used where possible at other locations. Waste material shall be disposed of at a location, at least 30 m from a watercourse, where it cannot wash into a watercourse.
- b) Asphalt emulsion pumps, shovels, rakes, etc., which require cleaning with diesel or similar fuels, are cleaned only at the maintenance depot. All used fuel should be collected in closed containers and recycled or disposed of at an approved facility.
- c) Empty drums shall be returned to the maintenance depot and from there for proper disposal.

6.1.2 Grading and Graveling

Discussion

Grading is used to reshape unpaved roads to maintain proper crown and remove ruts, potholes and washboard conditions. Graveling is used to restore grades to unpaved roads and to restore grade and shape to shoulders.

Protection Measures

- a) To minimize dust generation, grading should normally be undertaken after periods of wet weather.
- b) Grading should not leave ridges along the side of the road that would prevent the sheet-flow runoff.

6.1.3 Dust Control

Discussion

Calcium chloride is applied to gravel roads for dust control. Liquid calcium chloride is applied by tanker truck by private Contractors. Flake calcium chloride is applied by DOT maintenance personnel.

Protection Measures

- a) All calcium chloride should be stored in a dry place away from traffic areas.
- b) Calcium chloride should only be used to remedy extreme dusty conditions.
- c) Care shall be taken to ensure application criteria are followed as prescribed in the Highway Maintenance Management System Manual. Application shall be restricted to the driving surface only.
- d) Tankers used in the application of liquid calcium chloride shall not be washed out within 30 m of a watercourse or in an environmentally sensitive area.

6.1.4 Ditching

Discussion

Ditching is undertaken to effect drainage of the roadbed and to correct deficiencies such as erosion, non-conformity in grade, line, or cross-section of ditch, water ponding on roadway, and restrictive vegetative growth that impedes drainage of the road bed.

Protection Measures

- a) A Watercourse Alteration Permit shall be obtained for construction and maintenance of ditches which break a streambank or create a danger of pollution. A copy of the Watercourse Alteration Permit for the project is to be kept on site at all times and all DOT and Contractor personnel are to be familiar with the stipulations within it, as well as any documents referred to in the permit.
- b) Where possible, a buffer zone of 30 m shall be kept between the end of ditching and all watercourses. A type C Check Dam (i.e. hay bales) shall be installed at the end of the ditch (where the ditch meets the buffer zone). Additional erosion control structures should be installed further up the ditch as required.
- c) Side slopes should be as flat as possible within the limits of the ROW and terrain.
- d) Natural drainage should be maintained whenever practical.
- e) Ditches should be directed into surrounding vegetation where possible rather than emptying into a natural watercourse.
- f) Sediment deposited in the ditch should be removed when it reduces the capacity of the channel. Removed material and sediment shall be disposed of at a location at least 30 m from a watercourse and such that it cannot wash into a watercourse.

Suitable material shall be used when needed to fill in washouts, depressions, and the like on foreslopes or backslopes.

- g) Riprap should be used to line the bottom of ditches that have steep grades and/or excessive erosion.
- h) Petroleum-contaminated material encountered in the ditch shall be reported to DOE and appropriate remedial measures initiated.

- i) Sanitary outfall encountered in the ditch shall be reported to the Department of Health and Community Services.
- j) To ensure stabilization, the ditch may be hay mulched, hand seeded, hydroseeded, or lined with jute matting, depending on the erosion potential.
- k) Erosion control structures shall be installed as directed and maintained for as long as required.

6.1.5 Culvert Replacement and Repairs to Drainage Structures

Discussion

Culverts, property accesses, offtakes, catch basins, drop inlets and road-bed subdrains are cleaned and repaired as required to ensure their proper operation.

Construction of a culvert is done in accordance with requirements specified in the Watercourse Alteration Permit (see Section 5.3).

Protection Measures

- a) Watercourse Alteration Permits shall be obtained before conducting any work within 30 m of a watercourse. A copy of the Watercourse Alteration Permit for the project is to be kept on site at all times and all DOT and Contractor personnel are to be familiar with the stipulations within it, as well as any documents referred to in the permit.
- b) Erosion control measures shall be installed as required (see Sections 4.3, 4.5, and 5.3).
- c) Undesirable material (branches, etc.) blocking the flow of water through structures shall be removed from the watercourse for proper disposal so as to prevent it from reentering the watercourse.

6.1.6 Mowing and Brush Cutting

Discussion

Mowing and brush cutting maintain safe sight distances, facilitate snow and ice removal, prevent drainage obstructions, and improve roadside appearances.

Protection Measures

- a) All vegetative growth shall be controlled through manual and mechanical means. Herbicides shall not be permitted.
- b) Because of the climatic diversity in the province, mowing is not carried out by specific dates in every district. Ideally districts should mow grasses during the summer when seeds have ripened. Mowing and other equipment should not proceed if the ground is soft, to prevent rutting, exposure of new ground, root damage, ponding of water, etc.
- c) Within 30 m of a watercourse (including wetlands), mowing and brush cutting shall not be conducted without first obtaining a Watercourse Alteration Permit. Slash shall not be allowed to enter any watercourse (see Sections 3.2.2 and 4.1).
- d) Chipping of brush and spreading (not piling) on ROW is an acceptable method of brush disposal (see Section 4.1).
- e) Burning shall be permitted only in rural areas where it does not create a nuisance, fire, or health hazard and does not restrict traffic vision. Tires or waste oil shall not be used to start fires. Burning permits shall be obtained from DOE and DNRE (see Section 4.1).

6.1.7 Litter Barrels and Litter Pick-Up

Discussion

Litter barrels are provided for the convenience of the public at various roadside locations. Pick-up of litter along the ROW is encouraged.

Protection Measures

- a) All litter collected shall be disposed of at appropriate solid waste disposal facilities.
- b) Litter barrels should be serviced at regular intervals to minimize the nuisance potential of the sites.

6.1.8 Dump Maintenance

Discussion

A number of dumps are and have been operated by DOT in rural areas of the province. These sites are being replaced by regional solid waste disposal facilities. When no longer required, the dumps are closed in accordance with DOE requirements. Typical closure activities include exterminating rodents, grading and covering of wastes, restricting public access, providing surface water controls, and carrying-out monitoring activities.

Protection Measures

For dumps which are still operational:

- a) The working areas of dumps should be maintained as small as possible.
- b) Burning is not permitted during the high fire index months of May through November except with approval of DNRE.
- c) Tires or waste oil shall not be used to start fires.
- d) Burning shall only take place on days where prevailing winds will not cause nuisance to adjacent property owners or affect visibility on adjacent roads.
- e) Firebreaks shall be maintained all around the dump area. These firebreaks shall be at least 15 m in width dug to mineral soil and all combustible material removed.
- f) Wood wastes (i.e large stumps and tree trunks), white goods, car bodies and tires should be deposited in locations separate from the household refuse.
- g) Refuse should not be allowed to accumulate out of trenches. All wind-blown and scattered refuse should be collected and deposited in trenches on a regular basis.
- h) Commercial dumping of animal carcasses, petroleum contaminated soil, fish by-products, septic sludge, and hazardous materials are prohibited.
- i) Pest control shall be carried out by qualified personnel only.

6.1.9 Sign and Guiderail Maintenance

Discussion

Regulatory signs are erected and maintained as required to control and facilitate the safe movement of traffic. Guiderails are used at locations of roadside hazards.

Protection Measures

- a) Treated wood ends should be collected for disposal at the appropriate solid waste disposal facility (not burned).
- b) Care shall be taken to minimize spillage of preservatives used in the treatment of cut ends of the wood posts. Empty cans shall be returned to the maintenance depot and disposed of or stored in an environmentally acceptable manner.

6.1.10 Weigh Scale Pit Maintenance

Discussion

Weigh scale pits and pit drains are cleaned and repaired as necessary.

Protection Measures

- a) Dirt and debris from weigh scale pits and pit drains should be disposed of at the appropriate solid waste disposal facility.

6.1.11 Minor Maintenance of Equipment

Discussion

Service and minor repairs to equipment are performed at maintenance depots by operators or field crews. Waste oil and used solvents are picked up under contract with approved private companies for recycling or disposal.

Protection Measures

- a) Routine washing with water should take place, where possible, at those sites equipped with oil-water separators.

- b) At sites without separators, care shall be taken to minimize the potential for petroleum contamination by locating wash areas away from watercourses and minimizing the quantity of wash water.
- c) Washing of specialized equipment (i.e., chipseal vehicles, engines, etc.) should only take place at facilities that are properly equipped to treat the contaminated wastewater.
- d) Equipment leakages can occur suddenly (i.e., rupture of a hydraulic hose) or may take place over a long period of time (i.e., leaks from radiators or fuel tanks). Such incidents shall be repaired immediately upon detection.
- e) Care shall be taken to prevent oil, antifreeze, etc. from entering floor drains.
- f) A supply of absorbent materials to pick up spills shall be maintained at all maintenance depots.
- g) Not more than 500 litres of waste oil shall be stored in temporary storage containers. All containers, drums, pails, etc., shall be closed and provided with a drip pan.
- h) Oil filters shall be drained overnight before being recycled or disposed of at a solid waste disposal facility (proposed Used Oil Regulation under the Clean Environment Act, expected in 1998, will ban the practice of sending filters to landfills).
- i) Liquid levels and water levels in underground waste oil tanks shall be dipped and levels recorded weekly.
- j) Oil water separators shall be dipped and levels recorded weekly or any time a spill is known or suspected.

6.1.12 Fuel Installation Management

Discussion

Gasoline and diesel fuel are available at most DOT sites. Many sites are equipped with computrol units allowing 24 hour access to fuel by outside users.

Protection Measures

- a) All petroleum storage tank systems shall be registered under, and in compliance with, the Petroleum Product Storage and Handling Regulation - Clean Environment Act (New Brunswick Regulation 87-97).

- b) For underground petroleum storage systems, cathodic protection testing and precision testing (leak detection) shall be performed as per Regulation 87-97.
- c) Gasoline and diesel tanks shall be dipped and reconciled daily, and all information is to be provided on the "Petroleum Product Inventory Control Record". When a loss of liquid or a gain of water of 5 mm or more, or when the water at the tank bottom exceeds 50 mm, or when a sensor panel goes into alarm, the Supervisor and Maintenance and Traffic Branch shall be notified immediately.
- d) Pumps, hoses, nozzles, etc., shall be checked for any signs of leakage and serviced regularly.
- e) Fuel clips or other mechanical devices shall not be used to prop open the nozzle. The nozzle shall not be left unattended.
- f) The following signs shall be maintained at all fuelling facilities:
 - (i) "No Smoking";
 - (ii) "Off Ignition"; and
 - (iii) "Do Not Leave Nozzle Unattended".
- g) Any spills or leaks shall be immediately cleaned up. Any spills or leaks which occur on non-absorbing surfaces shall be removed with the aid of an absorbent. Petroleum contaminated soil shall be taken to an approved treatment site for disposal.
- h) In the event of a spill or leak, the following shall be notified immediately:
 - (i) Coast Guard 1-800-565-1633;
 - (ii) DOT Supervisor;
 - (iii) Vehicle Management Agency 453-2601 (fax 453-3628);
 - (iv) Maintenance and Traffic Branch 453-2600 fax 457-7278); and
 - (v) Local Fire Prevention Authority.

These representatives will advise as to the subsequent course of action.

6.1.13 Stockpiling Summer Maintenance Materials

Discussion

Materials required for summer maintenance operations are stored at the maintenance depots.

Protection Measures

- a) Care shall be taken to ensure that only minimal quantities of summer maintenance materials are stored on site.
- b) Asphalt emulsions shall be stored where they will not be subject to damage and where they will be prevented from freezing.
- c) Bagged calcium chloride shall be stored in a dry environment away from traffic areas.

6.1.14 Traffic Paint

Discussion

Throughout the province, DOT applies approximately 500 000 litres of traffic paint per year. Traffic paint is manufactured under Federal Specification 1.206-M89. Most traffic paint is purchased in returnable, re-useable containers. The bulk containers, 1100 litre totes, are refilled frequently and only require cleaning once a year. Cleaning and disposal of the containers is the responsibility of the supplier/manufacturer.

Protection Measures

- a) Traffic paint shall be stored in well ventilated and specifically designated areas. These storage areas shall be marked/labelled with appropriate hazard signs and all ignition sources prohibited.
- b) Small quantities of paint designated for disposal shall first be allowed to harden, then disposed of in a regional landfill.
- c) Spray equipment is cleaned at roadside, away from any environmentally sensitive areas, with a volatile solvent. The solvent is collected and then added to other containers of traffic paint where it aids in the drying process.

6.2 WINTER HIGHWAY MAINTENANCE AND RELATED ACTIVITIES

6.2.1 Snow Removal, Salting, Sanding and Miscellaneous Winter Maintenance

Discussion

Highways, intersections, bridges, grade separations, and DOT parking lots are plowed.

Salt is applied to road surfaces to obtain clear driving lanes or bare centre strip within a reasonable time after a storm. Sand is applied to road surfaces to provide traction on snow-packed or iced surfaces according to the level of service policy.

Miscellaneous activities are undertaken as required to maintain the road system.

Protection Measures

- a) Snow shall not be dumped in wetlands, or environmentally sensitive areas.
- b) Salt and sand should be applied at rates prescribed and under the conditions outlined in the Highway Maintenance Management System Manual. Following these procedures will maximize the effectiveness of salting and sanding operations thereby minimizing the salt and sand requirements.
- c) Spreaders should be kept in calibration.
- d) Spinners should be adjusted to prevent overthrow (waste).
- e) The use of calcium chloride to clear ice from drainage structures should only be used as a last resort. Steaming should be the first resort unless the situation or location makes it impractical or impossible to use.

6.2.2 Stockpiling Winter Maintenance Materials

Discussion

Materials required for winter maintenance operations are stockpiled at the maintenance depots. Salt is stored indoors. Sand is stored indoors or outdoors depending upon the site storage capacity. Salt is added to sand stockpiles in order to prevent freezing.

Protection Measures

- a) Care shall be taken to ensure that only minimal quantities of winter maintenance materials are stored on site (i.e. only one season's supply of materials).
- b) All salt shall be stored in a structure designed for that purpose (salt dome or salt shed).
- c) Loading of salt into DOT vehicles shall take place inside the storage structure or as close to the entrance as possible. To minimize spillage, loader buckets shall be partially full during loading. Any spills in the yard should be immediately re-stockpiled.
- d) Sand, where possible, shall be stored in domes. Stockpiling procedures as outlined in the Highway Maintenance Management System Manual shall be followed.

Where possible, sand should be stockpiled away from locations where there is potential for contamination of groundwater sources. Site drainage should be directed away from storage locations.

6.3 BRIDGE MAINTENANCE

6.3.1 Maintenance of Bridge Superstructure

Discussion

Repair and replacement of damaged or deteriorated bridge components are undertaken as required to ensure the structural integrity of the structure.

Protection Measures

- a) All waste generated in the removal of damaged and deteriorated components shall be collected for proper disposal.
- b) All materials, where possible, should be reused. Non-salvageable materials shall be disposed of at a solid waste disposal facility.
- c) Untreated wood waste may be burned provided the necessary burning permits are obtained from DOE and DNRE.
- d) All treated wood waste shall be placed in an approved landfill.
- e) All necessary precautions shall be taken to prevent discharge or loss of any harmful material or substance into the watercourse, including but not limited to hydrocarbons, sand blast media, concrete (asphaltic and Portland cement), fresh concrete, creosote timbers, and preservatives.

6.3.2 Maintaining Bridge Deck Drainage

Discussion

Bridge deck drains, weepholes, catch basins and drainage pipes are installed or repaired as necessary to prevent deterioration due to water and salt damage and to achieve drainage from bridge deck surfaces for safety reasons. Discharge water is directed away from all structural components of the bridge to the watercourse below unless the bridge design has incorporated another type of drainage system.

Protection Measures

- a) Drainage pipes are installed to transmit water from catch basins located at the end of the bridge to the toe of the slope. Geotechnical fabric and riprap shall be used at the drainage outlet to prevent erosion. Watercourse Alteration Permits shall be obtained where necessary prior to the commencement of work.

6.3.3 Chipseal

Discussion

Chipseal is applied to bridge decks and approaches to improve skid resistance of the deck surface and to extend the life of the deck.

Protection Measures

- a) No bridges located over watercourses shall be surfaced with liquid asphalt unless the necessary steps have been taken to prevent the asphalt from entering the watercourse.
- b) Where the danger exists of asphalt over-spray entering the watercourse, the sides of the bridge shall be skirted with sheet polyethylene (or similar protection).
- c) Where the danger exists of asphalt seeping through the deck into the watercourse, the bridge deck shall be underdraped with sheet polyethylene (or similar protection).
- d) Where it is considered impractical to protect a watercourse from asphalt contamination, chipsealing shall not be carried out.

6.3.4 Maintaining Bridge Substructure

Discussion

Repair and replacement of damaged or deteriorated bridge substructure components are undertaken as required to ensure the structural integrity of the structure.

Protection Measures

- a) Watercourse Alteration Permits shall be obtained prior to commencement of work. A copy of the Watercourse Alteration Permit for the project is to be kept on site at all times and all DOT and Contractor personnel are to be familiar with the stipulations within it, as well as any documents referred to in the permit.

- b) Unsalvageable treated timber piles shall be disposed of at a solid waste disposal facility.
- c) All necessary precautions shall be taken to prevent discharge or loss of any harmful material or substance into the watercourse, including but not limited to hydrocarbons, concrete (asphaltic and Portland cement), fresh concrete, creosote timbers, and preservatives.

6.3.5 Cleaning Bridges

Discussion

Cleaning is undertaken to prevent the accumulation of dirt and debris which may restrict normal movement of the structure and/or retain moisture or chemicals, leading to bridge component deterioration.

Protection Measures

- a) The nesting habits of migratory birds (i.e., barn swallows, cliff swallows, eastern phoebes) shall be taken into consideration. Prior to commencement of work, the bridge shall be checked for signs of nesting. Where possible, activities which could destroy eggs or nestlings, shall not take place during the months of mid-May to mid-July inclusive on sections of bridges where migratory birds are found to exist.
- b) Where accumulations of dirt and debris are excessive, bridge surfaces shall be scraped or swept prior to blowing with compressed air or flushing. All material scraped loose shall be collected and disposed of away from the watercourse.

6.3.6 Application and Removal of Protective Coatings

Discussion

Deteriorated protective coatings are removed and new protective coatings are applied to bridge components and clearance beams to protect steel components from corrosion and to improve appearance.

Protection Measures

- a) The nesting habits of migratory birds (i.e., barn swallows, cliff swallows, eastern phoebes) shall be taken into consideration. Prior to commencement of work, the bridge shall be checked for signs of nesting. Where possible, activities which could destroy eggs or nestlings, shall not take place during the months of mid-May to mid-July inclusive on sections of bridges where migratory birds are found to exist.

- b) Protection measures as contained in the "Guidelines for the Application and Removal of Protective Coatings" prepared by DOE shall be followed.
- c) Where the spent blasting media is known to contain lead or other materials that may be considered hazardous, laboratory testing shall be undertaken to determine the appropriate waste disposal options.
- d) Solvents used in the cleaning of painting equipment shall be collected in a closed container and recycled by an approved solvent recycler.
- e) All empty coating, paint solvent and cleaner containers shall be disposed of in an environmentally acceptable manner.

6.3.7 Slope Protection

Discussion

Slope protection adjacent to abutments and piers on embankments and in coastal areas is installed, repaired or replaced as required.

Protection Measures

- a) Watercourse Alteration Permits shall be obtained as required prior to the commencement of work. A copy of the Watercourse Alteration Permit for the project is to be kept on site at all times and all DOT and Contractor personnel are to be familiar with the stipulations within it, as well as any documents referred to in the permit.
- b) All necessary erosion prevention and control measures shall be in place to prevent silt, debris etc. from washing into the watercourse.

6.3.8 Channel Maintenance

Discussion

Channel maintenance is undertaken to remove debris from the channel and bridge openings, to reshape channel to maintain stream alignment, and to repair damage resulting from scour, erosion and/or siltation.

Protection Measures

- a) Watercourse Alteration Permits shall be obtained as required prior to the commencement of work. A copy of the Watercourse Alteration Permit for the project is to be kept on site at all times and all DOT and Contractor personnel are to be familiar with the stipulations within it, as well as any documents referred to in the permit.
- b) Care shall be taken to minimize disturbance to the watercourse.
- c) Any debris and excavated material removed from the watercourse shall be disposed of at a location, at least 30 m away, where it cannot be returned to the watercourse.

6.3.9 Grouting

Discussion

Voids under approach slabs and inside granite stone abutments and piers are filled with concrete grout or other fillers.

Protection Measures

- a) All necessary precautions shall be taken to prevent discharge or loss of fillers into the watercourse.
- b) Grout pumping equipment shall not be cleaned within 30 m of any watercourse.
- c) Excess grout shall be disposed of away from the watercourse.

6.3.10 Stockpiling Materials

Discussion

Materials used in bridge maintenance activities are stockpiled at the Central and District Bridge Yards.

Protection Measures

- a) All materials shall be stored in an environmentally acceptable manner. Liquid products such as paints and thinners shall be stored in protected areas to minimize potential damage to the environment. All products shall be handled and stored in accordance with their Material Safety Data Sheets.

6.4 FERRY OPERATIONS

Ferry service is provided for passenger-vehicle traffic at locations where fixed crossings do not exist. The ferry system consists of self-propelled ferries and cable ferries.

6.4.1 Bilge Water

Discussion

Cable ferries operate by winching along a fixed cable. Water enters the ferries along with the cables. In the bilge, the water can become contaminated with oil and grease from the engine and hydraulic equipment.

Bilge water must be routinely removed from the ferries. Water contaminated with liquid hydrocarbons is removed by vacuum truck for treatment. Non-oily water originating from clean compartments is pumped overboard.

Protection Measures

- a) Bilge water should only be pumped under calm conditions and from uncontaminated areas.
- b) A vacuum truck should be used (as required) to clean the bilge entirely. The oily waste water is taken to an approved facility for disposal.
- c) The entire bilge should be steam cleaned annually.
- d) All engines and equipment are kept in good repair to minimize leakage. Any leaks, should they occur, are repaired immediately.

6.4.2 Minor Maintenance

Discussion

Service and minor repairs are performed on board by operators.

Protection Measures

- a) A supply of absorbent materials should be kept on board to pick up any minor leaks from vehicle traffic.

- b) Waste oil is collected in a closed container and placed immediately in a secure location. It is moved as soon as practical to a site serviced by an approved waste oil carrier for recycling or disposal.
- c) Servicing of diesel engines is undertaken as prescribed by Vehicle Management Agency.

6.4.3 Bunkering and Oil Transfer

Discussion

Fuel and lubricants are kept on board the ferries as required to meet safety and operational requirements.

Protection Measures

- a) Bunkering and oil transfers shall be performed in accordance with the procedures outlined in the DOT Ferry Operations Manual(s).
- b) Bunkering shall be carried out under the supervision of the ferry operator, marine engineer or designate.
- c) Bunkering shall not occur while the ferry is operating or while private vehicles are on board.
- d) In the event of a spill, the following shall be notified immediately (also refer to the Contingency Plan, Section 8.1):
 - (i) Coast Guard 1-800-565-1633;
 - (ii) DOT Supervisor;
 - (iii) Local Fire Prevention Authority;
 - (iv) Transport Canada Ship Safety Branch (506) 636-4748; and
 - (v) DOE Regional Office.
- e) An adequate supply of absorbent materials shall be kept on board to absorb minor leaks. A separate fully stocked oil spill response station shall be maintained on the ferry or in the storage shed on shore.

6.4.4 Ferry Cables

Discussion

Ferry cables must be replaced when they become worn.

Protection Measures

- a) All worn cables are removed from the waterway and rewound onto spools.
- b) The preferred method of disposal of the spools is through a scrap metal dealer for recycling.

6.4.5 Sewage and Litter Barrels

Discussion

Public toilets are provided on the self-propelled ferries. Outhouses or portable toilets are provided at the ferry landings for the cable ferries.

Protection Measures

- a) On-shore toilet facilities are pumped out by a licensed septic hauler as needed to maintain sanitary conditions.
- b) Holding tanks, where fitted, on self-propelled ferries are pumped out by a licensed septic hauler as needed to maintain sanitary conditions.
- c) Litter barrels located at ferry landing areas are subject to the protection measures in 6.1.7.

6.4.6 Cleaning Landings

Discussion

Cleaning is undertaken at paved landings to prevent the accumulation of dirt and debris.

Protection Measures

- a) Where accumulations of dirt and debris are excessive, the landing is scraped or swept prior to flushing. All material scraped loose is disposed of away from the watercourse and where it cannot be returned to the watercourse.

6.4.7 Ramp Construction

Discussion

Added height is required at the landings during spring high water conditions.

Protection Measures

- a) Additions to existing ramps should be constructed of sand bags lined with filter fabric and enclosing pit run gravel. Other ramp construction techniques may be employed provided that a similar level of protection from erosion is achieved.

6.4.8 Application and Removal of Protective Coatings

Discussion

Deteriorated protective coatings are removed and protective coatings are applied to ferries to protect steel components from corrosion.

Protection Measures

- a) Protection measures as contained in the "Guidelines for the Application and Removal of Protective Coatings" prepared by DOE are followed.
- b) Partial enclosure should be utilized for manual application and removal of protective coatings including chipping, scraping and brush/roller painting.
- c) Full enclosure should be utilized for abrasive blasting for removal and spray application of protective coatings.
- d) Spent blasting media should be disposed of at an approved waste disposal site. Where the spent blasting media is known or suspected to contain lead or other materials that may be considered hazardous, laboratory testing shall be undertaken to determine the appropriate waste disposal option.
- e) Solvents used in the cleaning of painting equipment shall be collected in a closed container and recycled by an approved solvent recycler.
- f) Empty cans of coatings, solvents, etc. shall be disposed of in an environmentally acceptable manner (i.e. crushed and buried at a dump or regional landfill).

6.4.9 Salt Storage

Discussion

Salt and sand are stored at ferry approaches for winter maintenance activities.

Protection Measures

- a) All salt and sand/salt mix shall be stored in a weatherproof container, subject to Section 6.2.2.

6.5 STORAGE, HANDLING, AND TRANSFER OF FUELS AND OTHER HAZARDOUS MATERIALS

Discussion

DOT and Contractor personnel are responsible for the safe handling and storage of fuels and hazardous materials used during maintenance activities. Gasoline, diesel fuel, grease and oil are needed for equipment, and solvents may be used for cleaning.

Protection Measures

- a) Protection measures (including those related to construction activities) are outlined in Section 4.19.

**SECTION 7: AREAS OF SPECIAL ENVIRONMENTAL
CONSIDERATION**

SECTION 7: AREAS OF SPECIAL ENVIRONMENTAL CONSIDERATION

This section outlines environmental protection measures to minimize the potential impact of highway construction and operation on particular areas of environmental concern, as described below, including environmentally significant areas and environmentally sensitive areas (see Section 1.2). The protection measures are for the most part generic in nature and are based on the hierarchical approach outlined in Section 1 (i.e., avoid, minimize/mitigate, or compensate). It is recognized that in unique circumstances, site-specific environmental protection plans or measures may need to be developed in consultation with appropriate provincial or federal departments.

7.1 AGRICULTURAL LANDS

Discussion

Productive agricultural land is a valuable resource and should be avoided whenever possible. When avoidance is not possible, care must be taken during planning, design, construction and operation activities to minimize damage and to accommodate the requirements of the property owner for continued use of the surrounding land.

Protection Measures

- a) DOT, in the highway planning and design process, minimizes the amount of productive agricultural land displaced (see Sections 3.1 and 3.2).
- b) DOT will purchase all private property within the identified highway ROW.
- c) When farming operations are divided by highway development, meetings are held with affected property owners to establish alternate access to severed properties. Although the standard practice is to establish a network of property access roads to the closest public highway, the possibility of providing livestock or machinery underpasses is also given consideration on a case by case basis.
- d) Arrangements shall be made with private property owners as necessary to provide access through the ROW to and from their property during construction.
- e) Routes of travel on the ROW to and from private property, as arranged in c), shall be identified and clearly marked in the field. Contractor and DOT personnel and equipment passage shall be restricted to these routes of travel.

- f)** Where farm fences have been cut, they shall be repaired and/or replaced to original condition immediately, if needed for containment of farm animals.
- g)** Any adverse effects on property, such as rutting of farm or access roads, removal of livestock watering source and/or agricultural stream crossing, damage to buildings, sub-surface drainage systems, erosion control structures, drainage ditches, etc., resulting from execution of work, shall be repaired so as to return the property as closely as possible to pre-work conditions, or the owner shall be compensated.
- h)** Drainage and/or erosion and sediment control considerations for farmland should be examined in a spirit of co-operation by both DOT and DARD Engineers.

7.2 ENVIRONMENTALLY SIGNIFICANT AREAS

Discussion

Avoidance of environmentally significant areas is the main mechanism of protection which can be provided since the presence of highway facilities tends to reduce the ecological significance of such sites.

Protection Measures

- a) DOT attempts to avoid environmentally significant areas during highway planning and design (see Sections 3.1 and 3.2).
- b) When highway facilities are to be located within environmentally significant areas, project specific protection, mitigation, and compensation measures are developed in conjunction with the appropriate authorities.
- c) DOT attempts to minimize the amount of ROW required to build a new highway.

7.3 FISH HABITAT

Discussion

All activities which have the potential to affect fish habitat (watercourses used by fish) must be approved by DOE and DFO.

This is achieved through the provisions of the Watercourse Alteration Regulation - Clean Water Act. In accordance with this regulation, DOT applies for a Watercourse Alteration Permit for watercourse crossings, and the application is reviewed by the appropriate federal and provincial departments. Subsequently, a permit may be issued, with whatever conditions that are deemed necessary to protect fish habitat.

Under the NB Clear Water Act, a watercourse is defined as the full width and length, including the bed, banks, sides and shoreline, or any part of the river, creek, stream, spring, brook, lake, pond, reservoir, canal, ditch or other natural or artificial channel open to the atmosphere, the primary function of which is the conveyance or containment of water whether the flow be continuous or not. However, for the purpose of this document, watercourse may include marine shore drainage areas, intertidal zones and wetland areas (see Section 7.9).

Marine shore drainage areas are coastal lands that are effectively close enough to the shoreline to have an impact on the intertidal zone, this typically includes a 30 m area from each watercourse bank, in the portion of the watercourse which is under salt water influence. An intertidal zone is the area of the main coastline between the extreme high and low watermarks.

In order to protect these areas, mitigative measures identified for watercourse protection, including stipulations, as well as any documents contained in any watercourse alteration permits obtained, should be implemented as appropriate.

Highway development may affect fish habitat by either affecting water quality or by stream alteration.

Water quality relates to the quantity of physical and chemical substances suspended or dissolved in the water. The physical activity of equipment and personnel in and around a watercourse may result in sediment entering the watercourse. As well, grease, oil, and other hazardous materials may enter a watercourse from equipment activity or maintenance.

Sediment in a watercourse may affect fish both directly and indirectly.

Direct mortality, by suffocation due to sediment clogging of gill surfaces or from extreme stress due to hyperventilation, is a rare problem and will occur only under severe circumstances.

Indirect effects such as loss of habitat and food supply, are much more common. High turbidity caused by excessive sediment in the water column may disrupt spawning activities, impair feeding efficiency of fish, damage the breathing organs and clog the feeding apparatus of aquatic invertebrates, resulting in loss of this food source to fish species. Settled sediment may fill in rearing pools, reduce the intra-gravel flow of water in spawning areas, and suffocate the eggs of both fish and aquatic invertebrates.

Watercourse-crossing during highway construction and maintenance can result in the direct removal of small amounts of fish habitat and, if not done properly, could result in barriers to fish migration. Crossing at spawning areas can result in the direct loss of eggs.

Protection Measures

- a) The number of stream crossings and stream diversions are minimized, and critical fish habitats, angling pools, aquaculture sites, etc. are avoided. This is achieved by the avoidance, if possible, of interchange locations and sections of highway alignment running parallel or in close proximity to watercourse features.
- b) Means of lessening impacts on fish habitat at the design stage are detailed in Section 3.2.4.
- c) Other protection measures related to fish habitat have been detailed in Sections 4 and 5; Construction Activities, and Structures, respectively.
- d) Prior to culvert installation(s), DOT may be required to carry out fish rescues on fish populations that may be directly impacted by construction.

7.4 FOREST RESOURCES

Discussion

The major concern between forest resources and highway facilities in New Brunswick is the preservation of intensively managed forest lands (e.g. silvicultural lands). Concerns of individual property owners are usually of a site-specific nature.

Protection Measures

- a) The DOT, during the highway planning and design stage, minimizes the amount of intensively managed forest land displaced (see Section 3.1).
- b) DOT shall negotiate the purchase of property directly from the property owner.
- c) Salvage of merchantable timber shall be carried out as specified in Section 3.2. Effort should be made to ensure that all merchantable timber is salvaged during ROW clearing.
- d) Vegetation control shall be carried out as specified in Section 6.1.6.
- e) Construction Contractors and DOT personnel should take all precautions necessary to prevent fire hazards at the worksite and should keep the worksite free of all flammable waste. Contractors shall be required to have available sufficient fire fighting equipment, in working order as required by DNRE under the Forest Fire Act.

7.5 MINERAL RESOURCES

Discussion

Areas containing valuable mineral resources are a concern where the presence of a highway and/or highway facilities interferes with existing or future mining operations. Areas previously mined are a concern due to the potential for subsidence.

Protection Measures

- a) DOT, during the highway planning stage, minimizes the amount of lands required for the highway corridor which contain valuable mineral resources (see Section 3.1), and avoids areas with potential for subsidence, when possible.
- b) DOT negotiates the purchase of property directly from the property owner.
- c) Arrangements shall be made with private property owners as necessary to provide access through the ROW to and from their property during construction and operation.

7.6 HISTORIC RESOURCES

Discussion

Historic resources include archaeological and historic sites and objects in New Brunswick that are protected under provincial legislation. The main mechanism of protection is avoidance wherever possible. However, objects of historical significance may be found during construction and maintenance. Provision must be made for protection of these discovered objects and sites.

Protection Measures

- a) Refer to Section 3.1 for details of DOT's commitment during highway planning and design to avoid historic resource sites.
- b) When required, DOT evaluates the potential for historic resources within proposed ROW using a two phase study.

First, DOT contacts the Archaeology Branch of DMCH, and other appropriate bodies, to identify known historical resources in or near the ROW.

Second, if there is no information available, DOT undertakes to have a licensed archaeologist conduct a field search of areas identified as having a high potential for historic resources.

- c) If field work is required, access to private property is normally obtained directly from the land owner prior to the work being carried out or through the 'notification of survey' letters sent to each land owner affected by the highway corridor. This survey is under the authority of Section 23 of the Highway Act. During the Environmental Impact Assessment Screening stage only a narrow (approximately two metres wide) centreline may be established.
- d) A report resulting from c) is attached to the registration package or submitted during the registration period, depending on the specific characteristics of a highway project. If the survey identifies any historical resources that would be affected by the new highway corridor, options for its protection are developed in conjunction with the Archaeology Branch of DMCH, and subsequently implemented.
- e) All fossils and other remains or items of geological or archaeological interest or value discovered during highway construction or operation are deemed to be the property of the Crown. The Contractor and DOT shall take all reasonable precautions to prevent employees or other persons from removing or damaging any such articles or items.

- f) In the event of the discovery of a historic resource, all work shall cease in the immediate area of the discovery until such time as DOT personnel, having consulted with the Archaeology Branch, advise those involved as to the disposition of the discovery, and authorize resumption of the work.

7.7 WATER QUALITY

Discussion

The protection of water quality during highway construction and maintenance is important not only because of implications to fish habitat (discussed under Section 7.3 on fish habitat), but also because of the other important resource potentials of lakes, rivers and streams. These other resource potentials include domestic and industrial water supply, recreational, agricultural and aesthetic uses. Water quality should be protected in an appropriate manner, and to meet the requirements of guidelines for the protection of water quality (see Section 4.12e).

The potential impacts of highway construction and maintenance on water quality relate to the potential for introduction of deleterious substances such as salt, grease, oils and chemicals into watercourses and groundwater, and sedimentation of watercourses.

Protection Measures

The environmental protection measures outlined in Sections 4, 5, and 6 cover many construction and maintenance activities and how to limit their negative impacts on water quality (see Section 4.17).

7.8 WILDLIFE AND WILDLIFE HABITAT

Discussion

The major concerns regarding the potential negative effects of activities related to highway facilities on wildlife include the following:

- the effects of encounters between construction or operation personnel, and animals;
- the displacement of wildlife from habitat either by direct removal, or by the effect of auditory disturbances associated with construction activities (the latter effect should be short-term in nature);
- the potential of severing natural wildlife travel routes by the physical barrier of the highway itself, resulting in road kills and an unsafe situation for the travelling public; and
- the fragmentation or permanent loss of wildlife habitat.

Permanent and temporary effects on populations caused by highway operation and construction are a major concern.

The federal Migratory Birds Convention Act affords protection to all migratory birds except hawks and owls. The Act states that no person may disturb, destroy, or take/have in their possession a migratory bird (alive or dead), or its nest or eggs, except under authority of a permit.

The Canada Wildlife Act states that the Minister of the Environment, in cooperation with any provincial government, may take any measures deemed necessary to protect endangered wildlife species. In keeping with the intent of this statute, the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) was formed and given the mandate of identifying species at risk in Canada.

When a species at risk, identified under the Endangered Species Act, or listed as endangered, threatened, or vulnerable by COSEWIC, is involved, and where the habitat potentially affected is critical to that species for breeding or rearing of young, or as a limited food source, care shall be taken to avoid or minimize effects during the route selection stage and the construction and maintenance activities.

Protection Measures

- a) Refer to Section 3.1 for details of DOT's commitment during highway planning and design to avoid known sensitive flora and fauna areas.

- b) If construction activity is to occur in deer wintering areas, then construction is scheduled, wherever possible, to avoid periods when aggregations occur.
- c) In areas where high wildlife concentrations (e.g. deer or moose) are expected to interact with the highway, the possibility of incorporating wildlife crossings into the highway design is investigated. The investigation normally looks at the feasibility of locating a crossing and a cost analysis for the most efficient type of structure. Such crossings are located in consultation with DNRE wildlife biologists.
- d) If construction cannot be scheduled to avoid the period of deer aggregations, then all attempts are made to minimize deer/construction activity interaction.
- e) If blasting is to occur in an area of known animal aggregation, such as a deer wintering area, waterfowl staging aggregation or a migratory bird staging area or colony, DOT should consult with DNRE or the Canadian Wildlife Service of Environment Canada, as appropriate, to institute a mechanism to control blasting so as to minimize potential impacts on animals.
- f) All refuse shall be disposed of at an approved facility to avoid the attraction of nuisance animals.

7.9 WETLANDS

Discussion

Wetlands are lands transitional between terrestrial and aquatic systems where the water table is usually at or near the surface or the land is covered by shallow water at some time during the growing season. Wetlands are characterized by poorly drained soils and predominantly hydrophytic or water tolerant vegetation (A Wetlands Policy for New Brunswick).

Wetlands support a variety of important functions including groundwater recharge and discharge, flood control, water quality control, sediment stabilization, nutrient transport/transformation, fish habitat, wildlife habitat, and biomass production/export.

Activities associated with highway construction and maintenance may cause alterations to wetlands that result in physical and biological impacts. The physical impacts may include the following:

- change in mean water level;
- change in periodicity of water level fluctuation;
- change in wetland circulatory patterns;
- alteration of local water table levels;
- drainage of surface waters;
- elimination of periodic flooding and fertilization;
- change in retention storage;
- dampening of tidal variations;
- alteration of salinity patterns;
- increase in turbidity;
- increase in sedimentation;
- increase in chemical pollution; and
- increase in temperature patterns.

The biological impacts may include the following:

- change in wetland size;
- change in wetland plant species composition;
- change in wetland class composition;
- change in primary productivity;
- change in secondary productivity;
- sudden mortality of aquatic species;
- barrier to animal movements;
- encouragement of beaver activity; and
- harmful alteration or destruction of habitat of species at risk.

The Federal Policy on Wetland Conservation emphasizes a coordinated and cooperative approach to wetland conservation. The "no net loss of wetland functions" protection policy is intended to prevent further degradation of wetland resources. The "no net loss" goal requires mitigation alternatives such as minimization of wetland habitat disruption, and compensation measures to be set in place when wetland loss is unavoidable.

It is the intent of DOT that biological effects can and should be mitigated at the physical impacts level.

Protection Measures

- a) During the preliminary planning phase of a project wetlands are identified through review of the New Brunswick Wetlands Atlas and aerial photography for the area to be developed, and through consultation with DNRE. Attempts are made to avoid any wetlands.
- b) When wetlands cannot be avoided, discussions with DNRE, DFO, and DOE precede any design work. These discussions detail any special precautions needed for individual projects, on a site-specific basis.
- e) Discussions at the design phase take place among various branches within DOT (Structures, Design, Planning, etc.) to identify any special design characteristics of the project. Special design considerations for designs involving drainage structures may include the following:
 - (i) the culvert system is sized to provide water level equalization across fills similar to natural conditions;
 - (ii) culverts are designed to allow peak flows to dissipate at normal rates and prevent damming;
 - (iii) emphasis is placed on design features that retain established circulatory patterns. Fills and culverts are designed to minimize any channelization. Careful placement of culverts is made at areas that are shown to have significant natural circulatory flow;
 - (iv) highway design considers fill permeability and substrate compression requirements and makes allowance for adequate passage of subsurface water. Diffuse drainage patterns are maintained where possible;
 - (v) design features and construction methods are employed that will minimize draining surface water. Channels are not created that would eliminate areas of surface water concentrations on the site, where possible;

- (vi) design features that tend to stabilize standing water through damming effects or which facilitate rapid drainage at times of high water are avoided;
 - (vii) design considerations include channel and culvert designs that avoid rapidly draining wetland waters. Culvert placement is undertaken to support flows during low water periods;
 - (viii) culvert design considerations account for peak tidal flows in both directions; and
 - (ix) in coastal areas, highway design includes consideration to avoid interference with tidal and freshwater flows. Adequate waterways are employed to maintain existing flow patterns and the integrity of the wetland.
- d) Highways are designed and constructed to minimize the areal extent of the footprint in wetlands:
- (i) median widths are reduced and embankment foreslopes are increased to 2:1, where conditions permit;
 - (ii) all activities are maintained within the ROW, and care is taken to ensure that disturbance does not extend into other areas of the wetland; and
 - (iii) clearing is limited to just beyond the toe of slope to reduce the area of ground disturbance and clearing of vegetation within the ROW.
- e) Construction is scheduled to avoid undertaking activities during sensitive periods for wildlife, where possible. Work scheduling and progression requirements may be detailed in the Particular Specifications for a project.
- f) Erosion and sedimentation control practices are employed at the construction site, consistent with those described for watercourse protection in Sections 4 and 5. Additional protection measures include:
- (i) site-specific erosion and sedimentation control plans developed for each wetland crossing;
 - (ii) control of turbidity resulting from highway construction and maintenance through the control of erosion and highway runoff; and
 - (iii) clean, coarse fill materials to minimize sediment loadings in runoff.

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- g)** Highway design features include consideration of requirements for provision of wildlife passage structures, when required.
 - h)** Drainage structures are maintained free of blockage to prevent barriers to wildlife and fish passage.
 - i)** Locations with species at risk are avoided when possible. Rare plants are transplanted outside the disturbed area and within the same habitat type, where practical.
 - j)** Excavated materials which are not competent for construction purposes and other surplus materials are removed from the construction site and disposed of in an approved upland area. Where excavated materials will be used in construction, they are isolated from adjacent wetland habitat to prevent off-site movement of sediment.
 - k)** Measures to reduce the potential for hazardous material releases and damage by heavy equipment may include the following:
 - (i)** all construction equipment is maintained in good mechanical condition, and is monitored for fluid leakage;
 - (ii)** where possible, low-impact vehicles are used and heavy equipment is operated from ground mats to minimize ground disturbance;
 - (iii)** all hazardous materials are kept in designated areas provided with adequate containment for stored materials;
 - (iv)** construction material processing facilities are not located in wetland habitat;
 - (v)** contingency plans are in place to deal with accidental events; and
 - (vi)** equipment parking or turn around areas required during construction are designed to be located at either end of the wetland crossing.
 - l)** Environmental protection measures are inspected to ensure proper performance, and to identify additional requirements.
 - m)** When required, a compensatory mitigation plan is developed in consultation with DNRE and DOE to provide adequate compensation for residual impacts.
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7.10 FLOODING

Discussion

Flood prone areas are avoided when possible. Concerns during construction and operation are associated with damage that may result in significant sediment discharges into the watercourse.

Protection Measures

- a) DOT, in the highway planning process, avoids or minimizes the amount of area prone to flooding (see Section 3.1).
- b) DOT follows those stipulations identified in the Canada - New Brunswick Flood Damage Reduction Program (January 31, 1997).
- c) DOT designs the embankments to minimize potential backwater effects.
- d) DOT's commitment to sedimentation and erosion control has been detailed in Section 4.

7.11 ACID-GENERATING MATERIAL

Discussion

Areas containing acid-generating material, typically sulphide-bearing rock, are a concern where the acid drainage produced may affect nearby watercourses or wetlands.

Protection Measures

- a) DOT, during the highway planning and design stage, avoids or minimizes the amounts of lands required for the highway corridor which contain acid-generating material.
- b) Where acid-generating material cannot be avoided, site-specific protection measures shall be developed and may include the following:
 - (i) the removal of any vegetation or soil overlying the rock is limited to satisfy construction or operation requirements;
 - (ii) surface run-off is diverted away from the disturbed area where the sulphide-bearing rock is exposed or will be exposed so that no adverse effect is caused or may be caused;
 - (iii) the volume of rock disturbed is minimized in all cases and mechanical methods are used whenever possible to avoid blasting;
 - (iv) all construction activities are scheduled to minimize exposure time of the sulphide-bearing material;
 - (v) run-off from the disturbed area is diverted to a centralized point before leaving the property, monitored, and treated if required; and
 - (vi) other requirements as stipulated in the Plans and Particular Specifications.
 - (vii) excavated sulphide-bearing rock is removed immediately, and placed, or disposed of at an approved site, in an approved manner, as follows, or as otherwise authorized by the Engineer:
 - the placement/disposal site is located no closer than 60 m from a watercourse or well unless approved by the Engineer;

- the sulphide-bearing rock is covered with an impervious material such as clay or a geosynthetic (bentonite/geotextile) liner no later than 30 days after the first load is deposited on the placement/disposal site;
- the placement/disposal site surface is contoured to prevent ponding; and
- effluent or runoff from the site is directed to a centralized collection point, monitored for pH, aluminum, conductivity, and other parameters to meet regulatory requirements, and if the specified concentrations are exceeded, the collected effluent is treated prior to discharge.

7.12 CONTROL AND REMOVAL OF BEAVERS AND BEAVER DAMS

Discussion

Beavers and beaver dams are removed to protect the integrity of the highway infrastructure.

Protection Measures

- a) If the removal work requires more than simple chainsawing and hand removal of the dam or obstruction, or will entail the release of silt or sediment, a Watercourse Alteration Permit must be obtained.
- b) The beaver dam or obstruction is removed in steps from the top. This allows the backed-up water to lower gradually, reducing the risk of downstream flooding or erosion damage from surges of water.
- c) Removal of the beaver(s), if necessary, is done by a DOT employee who has graduated from the DNRE Trapper Education Course and who holds a current Fur Harvester's License, or by a licensed and certified private Contractor.

SECTION 8: CONTINGENCY PLANS

SECTION 8: CONTINGENCY PLANS

This section details procedures to be followed in case of emergency situations involving fuels or other chemicals, the discovery or encounter of sensitive wildlife or historic resources, forest fires, ice control, fish rescue operations, and required changes in regular procedures or schedules.

8.1 FUEL AND CHEMICAL SPILLS

Discussion

Sections 4.17 and 6.4.2 detail normal operating procedures to minimize environmental hazards in the storage, handling and transfer of fuels and other hazardous materials associated with highway construction and maintenance and ferry operation, respectively.

However, accidental releases of hazardous materials into the environment can occur. Plans and procedures are in place to respond to such emergency situations, thus helping reduce the impacts caused by hazardous substances. Hazardous substances also have information fact sheets accompanying them which describe the nature of the product, the precautions to be taken in handling, etc. This system of informing the user of the hazardous material is called WHMIS (Workplace Hazardous Materials Information System).

Protection Measures

- a) The province has in place a report outlining the **"Transportation of Dangerous Goods - SOP (Standing Operating Procedure) 7"**. Following is a brief description from that report of the procedure to be followed at the scene of a spill
 - (i) First group on the scene assumes a worst case scenario, and cordon off the area to others;
 - (ii) Safely attempt to retrieve shipper's emergency telephone number from the driver or the order papers to identify the materials involved and make a quick assessment.
 - (iii) Report all information at hand to headquarters or dispatcher (i.e. respective of the first group on the scene) as applicable.
 - (iv) Determine if the Coast Guard (1-800-565-1633) has been notified; **if not**, ensure that Coast Guard is notified giving all information at hand, so they can activate the response from DOE and the Emergency Measures Organization.
- b) DOT shall assist with the clean-up as required and provide signing and barriers for the public. It shall keep specified routes open for emergency vehicles.

8.2 WILDLIFE ENCOUNTER

Discussion

The purpose of a contingency plan in relation to accidental encounters with wildlife is to minimize both the potential disturbance of wildlife and disruption of work activity. In most cases worker and wildlife interaction may be expected to be short-term and minimal. However, wildlife species often have critical periods in their life cycles when any disturbance may result in displacement from their normal habitat, desertion of young, or other harmful reaction.

Protection Measures

- a) In case of persistent wildlife encounters, DOT personnel shall notify DNRE of the situation.

8.3 HISTORIC RESOURCES

Discussion

The Archaeology Branch of DMCH has prepared a series of guidelines for the evaluation of heritage resources in relation to linear developments. The purpose of any evaluation is to identify and address any concerns with regard to heritage resources that could result from the construction and/or operation of a highway facility.

Although DOT attempts to identify and avoid any impacts on historic resources during highway planning, such resources may not be known and may only be revealed as a result of construction.

Protection Measures

- a) Any DOT or contract personnel who discover an historic resource associated with highway construction must report the discovery as soon as reasonably possible to DOT's Resident or District Engineer.
- b) In the event of an historic resource discovery, all work shall cease in the immediate area of the discovery until such time as DOT's Resident Engineer, having consulted with the Archaeology Branch, advises those involved as to the disposition of the discovery and authorizes a resumption of the work. DOT may require that specific protection measures be implemented to ensure the integrity of the historic resource.
- c) No person, other than one authorized by the Minister of Municipalities, Culture, and Housing may move, destroy, damage, deface, obliterate, alter, add to, mark, or in any other way, interfere with an historic resource.

8.4 FOREST FIRES

The purpose of a contingency plan in relation to forest fires in and around a work site is to minimize the potential for the start of such fires, and to ensure that fires which do occur can be controlled immediately.

Protection Measures

- a) DOT and its consultants and Contractors shall take all necessary precautions to ensure that forest fires do not occur as a result of work activity.
- b) All necessary permits shall be obtained from DNRE and all regulations of the Crown Lands Act shall be followed.
- c) Contractors, consultants, and DOT personnel shall be prepared to control and fight any fires in and about the work area. Section 7.4 details responsibilities for fire fighting.

8.5 ICE CONTROL

Discussion

The purpose of a contingency plan in relation to ice control is to avoid damaging a bridge structure which may result in failure, and reducing backwater effects at culverts. Ice control can be accomplished using heavy equipment, when possible, or with the use of blasting materials. Concerns with blasting and excavation activities are associated with potential impacts to wildlife, and fish and fish habitat.

Protection Measures

- a) If conditions permit, the protection measures outlined in Sections 4 and 5 are implemented as appropriate to minimize the introduction of sediment into the watercourse. Exposed areas are revegetated following the winter season.
- b) Explosives shall be stored, handled, and used in accordance with both federal and provincial regulations and permits, and in such a manner as to reduce potential environmental risks.
- c) Blasting is to be conducted in accordance with the Guidelines for the Use of Explosives in Canadian Fisheries Waters. Contact DFO, Habitat Management Division Chief, as early as possible to identify resources at risk and to develop an effective mitigation plan.

8.6 FISH RESCUE

Discussion

Fish rescue operations are undertaken in consultation with DFO (Habitat Management Division) to prevent destruction of fish in situations where construction-related activities place fish in imminent danger of injury or death. Implementation of fish rescue operations typically occurs where an activity may result in the stranding of fish due to insufficient water flows (includes dewatering of confined areas in order to construct in-the-dry and watercourse diversions) and where blasting is required in or near a watercourse.

Protection Measures

- a) Requirements for fish rescue shall be determined early in the design process through identification of activities that could result in the destruction of fish and through investigations to determine the presence of fish in watercourses in proximity to the activities.
- b) All necessary licences shall be obtained from DFO prior to undertaking fish rescue operations.
- c) The area within watercourses potentially affected by the activities shall be identified and delineated in the field prior to commencing fish rescue operations.
- d) Methods employed for fish removal shall be dictated by conditions of the watercourse and shall be in accordance with stipulations of permits issued for the fish removal operations.
- e) Where appropriate, barrier nets shall be placed at the bounds of the delineated area. Fish within the bounded area(s) shall be removed by qualified individuals.
- f) Captured fish shall be removed to the outside of the bounded area. Where barrier nets are employed, the nets shall be maintained until the danger has passed, to prevent fish re-entering the area.

SECTION 9: ENVIRONMENTAL COORDINATION

SECTION 9: ENVIRONMENTAL COORDINATION

Discussion

Environmental coordination is undertaken to monitor compliance with relevant acts, regulations, procedures and internal guidelines during construction and maintenance activities, and to ensure that in-field decision-making is influenced by environmental considerations. Regular inspection should address commitments made during the EIA process, any conditions in the Specifications and attached to permits, and the protection measures outlined in this EPP.

The assigning of environmental coordination responsibilities during construction will depend on the significance of the environmental concerns associated with a project.

The Resident Engineer and Technician/Inspector, as DOT's representative on construction projects, are responsible for making field decisions regarding activities such as those indicated in this EPP. Matters requiring clarification in the field shall be handled by the Resident Engineer in consultation with one or more of the regulatory agencies. There may be situations where other DOT personnel may become involved, depending on the complexity of the issue.

DOT provides seminars for Resident Engineers and other construction field staff to inform them of environmental concerns and procedures to be implemented in the field. The seminars outline potential environmental concerns, protection measures to be implemented, and criteria to be used in field decision-making. Resident Engineers may request, at any time, assistance from other DOT personnel concerning environmental concerns or protection measures to be implemented.

Practical information on environmental protection measures for highway and bridge construction and maintenance is contained in DOT's Environmental Field Guide (EFG) (Washburn & Gillis Associates Ltd., 1998), a revision of the Field Guide on Environmental Protection Practices for Highway Construction and Maintenance (Washburn & Gillis Associates Ltd., 1994). Construction and maintenance staff in DOT's head office and districts receive a copy of the EFG, as well as training to improve their familiarity with the document. Contractors are also required to become familiar with the EFG as it relates to their contract work.

Environmental coordination on highway facilities after construction involves identifying areas where additional rehabilitation work may be required to correct erosion problems or stabilize water crossing sites, and identifying other potential environmental hazards. DOT's Highway Maintenance Management System Manual, and Bridge Maintenance Manual stipulate field task procedures for Environmental Protection.

Protection Measures

DOT ensures that environmental concerns are considered as part of construction and maintenance programs for highway facilities.

- a) DOT Resident Engineers and strategic maintenance personnel attend seminars on environmental protection practices for construction and maintenance projects.
- b) Resident Engineers on construction sites ensure that appropriate environmental protection measures are implemented and that all environmental requirements are met, consider the potential effects on the natural environment of all field decisions, and identify and address environmental problems not necessarily covered in the EPP.
- c) The Resident Engineer or his designate may stop the Contractor's work at any location where specified protection measures are not being adhered to. Such a work stoppage shall be for a period sufficient to comply with the relevant permits and specifications.
- d) DOT's Director of Construction is responsible for ensuring that Resident Engineers are adequately informed regarding environmental issues and requirements as relates to specific projects. The Director or other designate is contacted by Resident Engineers at any time there is doubt as to the implementation of environmental protection measures.
- e) Where possible, decisions on interpretation and procedure should be made in the field in consultation between the DOT Resident Engineer or designate and the responsible regulatory agencies' field personnel.
- f) Major problems are handled through the normal chain of command. However, those that are unable to be resolved at lower levels of management shall be referred to the office of the Chief Engineer.
- g) DOT's highway maintenance personnel identify and address environmental problems which arise during maintenance activities. DOT shall coordinate, advise and instruct maintenance personnel in the identification and correction of environmental problems associated with specific highway maintenance procedures.

Maintenance personnel are therefore an active participant in environmental protection during highway operations. The District Engineer should ensure that permanent protection measures implemented during construction are maintained during operation, and that all environmental protection measures or procedures relating to operational activities are implemented as required.

SECTION 10: EPP AND HIRED FIRMS

SECTION 10: EPP AND HIRED FIRMS

DOT hires consultants, surveyors, equipment rental firms, and other types of firms, depending on the specific task to be completed. It is expected that such firms doing work for DOT shall conform to this EPP where applicable.

DOT's highways are constructed under contracts awarded through a public tendering process. The contract documents contain a description of the work, the standards under which it is to be carried out, and the results expected to be obtained. The Specifications contain environmental protection measures as outlined in this EPP. Any new or site-specific protection measures, as determined by regulatory agencies or through the EIA screening or CEEA process, are detailed in the Plans and Particular Specifications of the contract.

The Contractors who are awarded DOT construction contracts have both the qualifications and experience to do the work. They have an appreciation for environmental protection, mostly from past work on DOT projects. To increase their knowledge of and compliance to environmental protection measures, all Contractors will be required to have their own copy(ies) of both this EPP and the DOT Environmental Field Guide (refer to Section 9).

SECTION 11: REFERENCE DOCUMENTS

SECTION 11: REFERENCE DOCUMENTS

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APPENDIX A

Key Contacts for Planning Input

APPENDIX A
Key Contacts for Planning Input

Name	Title	Phone #	Location
Department of Agriculture and Rural Development			
Michael Dillon	Manager, Land Information	453-3488	P.O. Box 20280 850 Lincoln Road Fredericton, NB E3B 4Z7
Department of Economic Development & Tourism			
John Moore	Project Executive, Agreements & Infrastructure Branch	444-5731	Centennial Building 670 King Street Fredericton, NB E3B 2B0
Les Bragdon	Project Executive (Tourism Part)	457-6878	Centennial Building 670 King Street Fredericton, NB E3B 2B0
Department of the Environment			
Kirk Gordon	Manager, Environmental Impact Assessment	457-4844	P.O. Box 6000 364 Argyle Street Fredericton, NB E3B 5H1
Department of Fisheries and Aquaculture			
Marianne Janowicz	Sustainable Development Specialist	453-2251	P.O. Box 6000 Fredericton, NB E3B 5H1
Department of Fisheries & Oceans			
Maurice Levesque	Habitat Management Division	851-7768	P.O. Box 5030 343 Archibald St. Moncton, NB E1C 9B6
Department of Municipalities, Culture & Housing			
Gérard Belliveau	Director, Planning	453-2171	Marysville Place P.O. Box 6000 20 McGloin Street Fredericton, NB E3B 5H1

APPENDIX A
Key Contacts for Planning Input (Continued)

Name	Title	Phone #	Location
Department of Natural Resources & Energy			
Janet Patch	Policy Analyst	453-2684	Hugh John Flemming Forestry Complex P.O. Box 6000 1350 Regent Street Fredericton, NB E3B 5H1
Environment Canada			
George Lindsay	Environmental Protection Branch	452-3286	77 Westmorland Street Suite 450 Fredericton, NB E3B 6Z3
NB Power			
Robert Thériault	Property Management Officer	458-4250	P.O. Box 2000 515 King Street Fredericton, NB E3B 4X1
NBTel			
Rick Cross	Technical Associate, Engineering	452-4502	P.O. Box 670 64 Allyson Boulevard Fredericton, NB E3B 5B4

APPENDIX B

Key DOT Departmental Contacts

APPENDIX B
Key Dot Departmental Contacts


Name	Title	Phone #	Location
Design Branch			
C. Herb Page	Director	453-2608	P.O. Box 6000 Kings Place Fredericton, NB E3B 5H1
Dan Deap	Assistant Director	453-2608	
Peter Crawford	Senior Design Engineer	453-2608	
Construction Branch			
Ken Lawson	Director	453-2673	P.O. Box 6000 Kings Place Fredericton, NB E3B 5H1
Henry Palmer	Program Manager - Structures	453-2673	
Mike Stanley	Program Manager - Grading	453-2673	
Structures and Materials Branch			
Fred Blaney	Director	453-2674	P.O. Box 6000 Kings Place Fredericton, NB E3B 5H1
George Dayton	Assistant Director	453-2674	
Dave Sullivan	Senior Hydraulic Engineer	453-2674	
Planning and Land Management Branch			
Gerald Goguen	Director	453-2754	P.O. Box 6000 Kings Place Fredericton, NB E3B 5H1
Brian McEwing	Assistant Director	453-2754	
Mike Phillips	Senior Planning Engineer	453-2754	
Maintenance and Traffic Branch			
Emilia Rodrigues	Director	453-2600	P.O. Box 6000 Kings Place Fredericton, NB E3B 5H1
Charles Connell	Assistant Director	453-2600	
Carol MacQuarrie	Environmental Engineer	453-2600	
Bathurst District Office			
Michel LaCroix	District Engineer	547-2144	P.O. Box 476 Bathurst, NB E2A 3Z4
Guy Jean	Maintenance Engineer/Manager	547-2144	
Daniel LeBlanc	Senior Resident Engineer	547-2144	
Gilbert Robichaud	Senior Resident Engineer	753-4488	P.O. Box 680 Campbellton, NB E3N 3H1

APPENDIX B
Key Dot Departmental Contacts (Continued)

Name	Title	Phone #	Location
Edmundston District Office			
Henri Allain	District Engineer	735-2088	486 Francis St. Edmundston, NB E3V 1G8
Francois Morin	Senior Resident Engineer	735-2037	
Fredericton District Office			
Neil Gilbert	District Engineer	453-2611	District 5 1025 College Hill Rd. Fredericton, NB E3B 5H1
John Cormier	Maintenance Engineer/Manager	453-2611	
Keith Thompson	Senior Resident Engineer	453-2611	
Miramichi District Office			
David Cogswell	District Engineer	778-6046	P.O. Box 248 Chatham, NB E1N 3A6
Bill Row	Maintenance Engineer/Manager	778-6046	
Allan Case	Senior Resident Engineer	778-6046	
Moncton District Office			
Robert Boudreau	District Engineer	856-2000	P.O. Box 129 Moncton, NB E1C 8R9
Ross Fisher	Maintenance Engineer/Manager	856-2000	
Janice Collette	Senior Resident Engineer	856-2000	
St. Stephen District Office			
Wesley Anthony	District Engineer	466-7340	P.O. Box 39 St. Stephen, NB E3L 2W9
Floyd Haley	Maintenance Engineer/Manager	466-7340	
John McCue	Senior Resident Engineer	466-7340	
Sussex District Office			
John Doohan	District Engineer	432-2014	P.O. Box 280 Sussex, NB E0E 1P0
	Maintenance Engineer/Manager	432-2014	
Alan Kerr	Senior Resident Engineer	432-2014	
Woodstock District Office			
Dale Forster	District Engineer	325-4450	P.O. Box 909 124 Upham St. Woodstock, NB E7M 2Y2
Gary Corey	Maintenance Engineer/Manager	325-4450	
Bruce Connolly	Senior Resident Engineer	325-4450	

APPENDIX C

Pre-Construction Activities Policy

Date: August 15, 1997		New Brunswick  Nouveau Brunswick Inter - Office Memo Note Interservices		
Name and Title / Nom et titre		Department and Branch / Ministère et division	Telephone / Téléphone	Reference / Référence
To: A:	Gérald Goguen, Director	Transportation Planning Branch		
From: De:	Nabil Elhadi, Director	Assessment and Approvals Branch	457-4848	4170-2
Copies To: A:	H. Page, DOT D. Sullivan, DOT F. Blaney, DOT J. Beunders, DOE			
Subject: Objet:	PRE-CONSTRUCTION ACTIVITIES FOR HIGHWAY CONSTRUCTION PROJECTS			

This is further to my previous memos regarding the above subject. As you are aware, in order to streamline the Watercourse Alteration Permit procedure for the Department of Transportation for the purposes of excavating test pits, test drilling and the clearing of trees within 30 metres of a watercourse for cross-section and centre line surveying, the Department of the Environment has established the following policy.

For highway construction projects which do not require registration under the EIA Regulation or are screened out of the EIA process, no permit will be required for the excavation of test pits, test drilling or the clearing of trees for survey purposes within 30 metres of a watercourse provided the attached conditions are adhered to.

Any activity for highway construction projects which are being evaluated under the EIA process will require a normal Watercourse Alteration Permit.

This policy will be effective August 1, 1997 to December 31, 1999. The policy will be evaluated at the end of this period and any necessary changes will be made at that time.

I trust that you will make your District Engineers as well as District staff aware of the above and the attached construction conditions in order to ensure that all conditions are adhered to during the pre-construction survey work.

I wish to take this opportunity to commend the Department of Transportation for the implementation of environmental planning and for adhering to the above policy during the past several years and we look forward to a continued cooperation between our departments.



Nabil Elhadi, P. Eng.
Director

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Attachment (1)

DEPARTMENT OF THE ENVIRONMENT

CONDITIONS FOR PRE-CONSTRUCTION
ACTIVITIES IN RELATION TO HIGHWAY PROJECTS

Effective August 1, 1997 to December 31, 1999

- (1) that any debris and excavated material be removed from the watercourse and adjacent areas and disposed of, or placed in a manner where it cannot be returned to the watercourse;
- (2) that all necessary precautions be taken to prevent the discharge or loss of any harmful material or substance into the watercourse; including but not limited to creosote, hydrocarbons, biocides, fresh cement, lime, paint or concrete;
- (3) that machinery and pollutants be located or stored in areas not in danger of floodwaters;
- (4) that if any artifacts of historic or archaeological significance are encountered during the sub-surface survey, work must be stopped immediately and the Director, Archaeology Branch, Department of Municipalities, Culture and Housing must be contacted;
- (5) that all activities undertaken under this approval conform with the Department of Transportation's "Environmental Protection Plan";
- (6) that should the proposed alignment be altered or the project not proceed, grubbed areas shall be rehabilitated; the plan for rehabilitation must be approved by the Director, Assessment and Approvals Branch, Department of the Environment;
- (7) the Department of the Environment must be notified of the location of the proposed work at least 72 hours before any activity takes place;

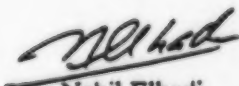
Test Pitting

- (8) that any ruts cut into the vegetative mat must be stabilized against erosion with evergreen boughs anchored in place with on site material obtained from a non-watercourse source;
- (9) that any soil exposed on the banks of a watercourse, be stabilized immediately with brush mats or seed and mulch;
- (10) that all test pits be backfilled immediately upon collection of the required data, smooth graded and all exposed erodible soil covered with evergreen boughs;

- (11) that the excavator cross the watercourse at one location only for each watercourse on a temporary log ford which must be removed once the final crossing is completed;
- (12) that no in stream work be carried out at anytime during this project;

Test Drilling

- (13) that no equipment, other than the drill rig, enter a watercourse during a test drilling operation;
- (14) that where possible, drilling in or near a watercourse be carried out using a Hollow stem Auger (dry bit) as opposed to a Rotary Drill which utilizes pressurized cooling/flushing fluid;
- (15) that if Rotary Drilling must be carried out in or near a watercourse a containment area be established, to prevent the drilling fluid from entering the watercourse;
- (16) that if Rotary Drilling must be carried out in the channel, the drill rig be fitted with recovery equipment to prevent the escape of drilling fluid to the watercourse;
- (17) that no advancement of drill casing by fluid jetting be carried out in or near a watercourse;
- (18) that when drilling is carried out on the ice over from the borehole, all material must be removed from the watercourse before the site is vacated;
- (19) that all boreholes in or near a watercourse be backfilled and sealed upon the completion of the survey.



Nabil Elhadi
Director
Assessment & Approvals Branch

/cbk